BUSINESS 1

Corporate Governance and Operations Management

1.	Corporate governance
2.	Operations management: Performance management and impact of measures on behavior
3.	Operations management: Cost measurement methods and techniques
4.	Class questions

NOTES

CORPORATE GOVERNANCE

I. RIGHTS, DUTIES, RESPONSIBILITIES, AND AUTHORITY OF THE BOARD OF DIRECTORS AND OFFICERS

A. Board of Directors Act as group if quorum - duly constituted

The primary role of an entity's board of directors is to safeguard the company's assets and to ultimately maximize shareholder return.

Among the specific duties of directors are the election, removal, and supervision of officers (directors generally review the conduct of officers and may remove an officer with or without cause); adoption, amendment, and repeal of bylaws; setting management compensation; and initiating fundamental changes to the corporation's structure.

1. Declaration of Distributions

The board of directors has sole discretion to declare distributions to shareholders, including dividends, in the form of cash, property, or the corporation's own shares. The shareholders have no power to compel a distribution.

2. Fiduciary Duties

Directors are fiduciaries of the corporation and <u>must always act in the best interests of the corporation</u>. However, directors are not insurers of the corporation's success. A director will not be liable to the corporation for acts performed or decisions made in good faith, if conducted in a manner that the director believes to be in the best interest of the corporation and with the care an ordinarily prudent person in a like position would exercise. (This is sometimes called "the business judgment rule.") Thus, directors will be liable to the corporation only for negligent acts or omissions (e.g., failure to obtain fire insurance, hiring a convicted embezzler as treasurer without looking at his record, etc.).

a. Right to Rely - Part of "due diligence"

A director is entitled to rely on information, opinions, reports, or statements (including financial statements) if prepared by any of the following:

- (1) Corporate officers employees or a committee of the board whom the director reasonably believes to be reliable and competent; or
- (2) Legal counsel accountants or other persons as to matters the director reasonably believes are within such person's professional competence.

b. Liability for Unlawful Distributions / Dividends

Directors may be held liable for authorizing a distribution in violation of law, such as when:

- the corporation would not be able to pay its debts as they become due in the regular course of business; or
- (2) the corporation's total assets would be less than its total liabilities.

Ethically

c. Duty of Loyalty

As part of their fiduciary responsibilities, directors owe their corporation a duty of loyalty and must act in the best interests of their corporation.

(1) The duty of loyalty prohibits directors from competing with the corporation, but does not necessarily prohibit directors from transacting business with the corporation (e.g., by buying from or selling to the corporation).

An action in which a director has a conflict of interest will be upheld only if:

- (a) after full disclosure, the transaction is approved by a disinterested majority of the board of directors or the shareholders; or
- (b) the transaction was fair and reasonable to the corporation.
- (2) The board of directors has the power to set director compensation.

d. Corporate Opportunity Doctrine

If a director is presented with a business opportunity that is of interest to his corporation (e.g., he is told that land the corporation is interested in buying has just been put on the market), generally the duty of loyalty prohibits the director from taking the opportunity for himself. He must present the opportunity to the corporation, and can take the opportunity for himself only if the corporation decides not to take it.

3. Indemnification

Generally, corporations are allowed to indemnify directors for expenses for any lawsuit brought against them in their corporate capacity. The corporation may also pay any judgment imposed in a lawsuit on the director, except in a shareholder derivative suit.

4. Limitation on Director Liability - Bad faith

The articles of incorporation may eliminate or limit a director's liability to the corporation for money damages for action taken as a director except to the extent of:

- financial benefits received by the director to which the director was not entitled;
- b. intentional harm inflicted on the corporation or the shareholders;
- c. unlawful distributions authorized by the director;
- d. intentional violations of criminal law; and
- e. breaches of the duty of loyalty.

5. Manage Principal-Agent Conflict

Another critical role of the board of directors is to manage any potential conflict of interests that may exist between the company's shareholders (principal) and senior management (agent). In this intermediary role, directors work to ensure that management does not act in a manner that could negatively impact firm value for the sake of an individual manager's own personal gain.



B. **Officers**

Officers are individual agents of the corporation who ordinarily manage its day-to-day operations and may bind the corporation to contracts made on its behalf.

Selection and Removal

Officers are selected by the directors and may be removed by the directors with or without cause. An officer may be removed even if the officer has a contract and the term of the contract has not expired (although the corporation may be liable for damages in such a case). - Actual - oral/written instruction

Authority Apparent - "title" CEO/CFO 2.

Officers are corporate agents, and agency rules determine their authority and power. A corporate president will generally have apparent authority to enter into contracts and act on behalf of the corporation in the ordinary course of business. - Corp. is liable

Fiduciary Duties and Indemnification 3.

Corporate officers, like corporate directors, are subject to fiduciary duties and must discharge their duties in good faith and with the same care as an ordinarily prudent person in a like position. Similar to directors, officers may be indemnified for expenses and judgments from litigation brought against them in their corporate capacity. Majority of

Also May Serve as Directors - But good corporate governance = board should be independent 4. Officers also may serve as directors of the corporation. It is not uncommon for the chief executive officer (CEO) and/or the chief financial officer (CFO) to also serve as a member of the board of directors.

Not Required to Be Shareholders

An officer is not required to be a shareholder of the corporation, but he or she may be. As part of their compensation, senior management may receive stock options to potentially purchase shares of the company's common stock.

II.

SARBANES-OXLEY ACT OF 2002 Enhanced financial disclosures

Fraud The Sarbanes-Oxley Act of 2002 has had a profound effect on the financial reporting requirements of public companies. In particular, there are numerous provisions for expanded disclosures by corporations and specific representations required by officers of public companies that must accompany published financial statements. Key provisions of the act related to those disclosures are described in Title III and Title IV of the act.



Title III—Corporate Responsibility CEO/CFO representations

The corporate responsibility section of the act relates to the establishment of an audit committee and the representations made by key corporate officers, typically the chief executive officer (CEO) and the chief financial officer (CFO).

Public Company Audit Committees 1.

- Public companies are responsible for establishing an audit committee that is directly responsible for the appointment, compensation, and oversight of the work of the public accounting firm employed by that public company (also referred to as an issuer).
 - The auditor reports directly to the audit committee.
 - (2) The audit committee is responsible for resolving disputes between the auditor and management.

- b. Audit committee members are to be members of the issuer's board of directors but are to be otherwise independent. Independence criteria are as follows:
 - (1) Audit committee members may not accept compensation from the issuer for consulting or advisory services.
 - (2) Audit committee members may not be an affiliated person of the issuer. (Affiliation means a person having the ability to influence financial decisions).
- c. Audit committees must establish procedures to accept reports of complaints regarding audit, accounting, or internal control issues.
 - (1) Procedures must accommodate confidential, anonymous reports by employees of the issuer.
 - (2) Procedures must accommodate receipt and retention of complaints as well as a method to address those complaints.

2. Corporate Responsibility for Financial Reports

Corporate officials, typically the chief executive officer CEO and chief financial officer CFO, must sign certain representations regarding annual and quarterly reports, including their assertion that:

- a. They have reviewed the report.
- b. The report does not contain untrue statements or omit material information.
- c. The financial statements fairly present in all material respects the financial condition and results of operations of the issuer.
- d. The CEO and CFO signing the report have assumed responsibility for internal controls including assertions that:
 - (1) Internal controls have been designed to ensure that material information has been made available.
 - (2) Internal controls have been evaluated for effectiveness as of a date within 90 days prior to the report.
 - (3) Their report includes their conclusions as to the effectiveness of internal controls based upon their evaluation.
- e. The CEO and CFO signing the report assert that they have made the following disclosures to the issuer's auditors and the audit committee:
 - (1) All significant deficiencies in the design or operation of internal controls which might adversely affect the financial statements.
 - (2) Any fraud (regardless of materiality) that involves management or any other employee with a significant role in internal controls.
- f. The CEO and CFO signing the report must also represent whether there have been any significant changes to internal controls.

3. Improper Influence on the Conduct of Audits

No officer or director, or any person acting under the direction thereof, may take any action that would fraudulently influence, coerce, mislead, or manipulate the auditor in a manner that would make the financial statements materially misleading.

See Coso

4. Forfeiture of Certain Bonuses and Profits - CEO/CFO pay for a restatement

If an issuer is required to prepare an accounting restatement due to material noncompliance with any financial reporting requirement under the securities laws, the CEO and CFO may be required to reimburse the issuer for:

- a. bonuses or incentive-based or equity-based compensation.
- b. gains on sale of securities during that 12-month period.

SOX B Title IV-Enhanced Financial Disclosures - Internal controls & Audit committee

The enhanced financial disclosures associated with issuer reports include additional details regarding the financial statements, internal controls, and the operations of the audit committee.

1. Disclosures in Periodic Reports (generally quarterly or annually)

Financial statement disclosures are intended to ensure that the application of GAAP reflects the economics of the transactions included in the report and that those transactions are transparent to the reader. Enhanced disclosure requirements include the following:

- a. All material correcting adjustments identified by the auditor should be reflected in the financial statements.
- b. The financial statements should disclose all material off-balance sheet transactions:
 - (1) Operating leases
 - (2) Contingent obligations Lawsuits
 - (3) Relationships with unconsolidated subsidiaries Related parties
- c. Conformance of pro forma financial statements to the following requirements:
 - (1) No untrue statements
 - (2) No omitted material information
 - (3) Reconciled with GAAP basis financial statements
- d. Use of special purpose entities (SPEs).
- 2. Conflict of Interest Provisions

The corporation

Issuers are generally prohibited from making personal loans to directors or executive officers.

- a. Exceptions apply if the consumer credit loans are made in the ordinary course of business by the issuer.
- b. Exceptions apply if the terms offered to the officer are generally made available to the public under similar terms and conditions with no preferential treatment.

Related 3.

Disclosure of Transactions Involving Management and Principal Stockholders

- a. Disclosures are required for persons who generally have direct or indirect ownership of more than 10 percent of any class of most any equity security. Disclosures are made by filing a statement.
- b. Statements are filed at the following times:
 - (1) At the time of registration.
 - (2) When the person achieves 10 percent ownership.
 - (3) If there has been a change in ownership.

See Coso 4. **Management Assessment of Internal Controls**

The assessment of internal controls is commonly referred to as Section 404 Each annual report is required to contain a report that includes the following:

- A statement that management is responsible for establishing and maintaining an adequate internal control structure and procedures for financial reporting.
- An assessment as of the end of the most recent fiscal year of the issuer, of the b. effectiveness of the internal control structure and procedures for financial reporting.
 - (1) The auditor must attest to management's assessment of internal control.

5. **Certain Exemptions**

Investment companies are exempted from this act.

Code of Ethics for Senior Officers - "Tone at the top" 6.

- Issuers must disclose whether or not the issuer has adopted a code of conduct for senior officers (e.g., CEO, CFO, controller, and chief accountant). If no code of conduct has been adopted, the issuer must disclose the reasons.
- The code of ethics contemplates standards that promote:
 - (1) Honest and ethical conduct (including handling of conflicts of interest).
 - Full, fair, accurate, and timely disclosures in periodic financial reports.

(3) Compliance with laws, rules, and regulations. Disclosure of Audit Committee Financial Expert 7.

At least one member of the audit committee should be a financial expert. Financial reports of the issuer must disclose the existence of a financial expert on the committee or the reasons why the committee does not have a member who is a financial expert.

"Liberal"

- A financial expert qualifies through education, past experience as a public accountant, or past experience as a principal financial officer, comptroller, or principal accounting officer for an issuer.
- Knowledge of the financial expert should include:
 - Understanding of GAAP. (1)
 - Experience in the preparation or auditing of financial statements for comparable issuers.
 - (3) Application of GAAP.
 - (4) Experience with internal controls.
 - (5) Understanding of audit committee functions.

Enhanced Review of Periodic Disclosures by Issuers By SEC 8.

The Securities and Exchange Commission (SEC) is required to review disclosures made by issuers, including those in Form 10-K, on a regular and systematic basis for the protection of investors. When scheduling reviews, the SEC should consider the following:

- Issuers that have issued material restatements of financial results. Risk 1 a.
- Issuers that experience significant volatility in their stock prices when compared to b. Motivation 1 other issuers.
- Issuers with the largest market capitalization. Material to market C.
- d. Emerging companies with disparities in price-to-earning ratios.
- Issuers whose operations significantly affect any material sector of the economy. e.

Large banks/insurance

SOX (C)

Title VIII—Corporate and Criminal Fraud Accountability Up to 10 or 20 years in jail

Criminal Penalties for Altering Documents

- Individuals who alter, destroy, mutilate, conceal, cover up, falsify, or make false entry in any record, document, or tangible object with the intent to impede, obstruct, or influence an investigation, will be fined, imprisoned for not more than 20 years, or both.
- Auditors of issuers should retain all audit and review work papers for a period of seven years from the end of the fiscal period in which the audit or review was conducted. Failure to do so will result in a fine, imprisonment for not more than 10 years, or both.

Statute of Limitations for Securities Fraud 12 and 51 2.

The statute of limitations for securities fraud is no later than the earlier of two years after the discovery of the facts constituting the violation, or five years after the violation.

Whistle-Blower Protection 3.

An employee who lawfully provides evidence of fraud may not be discharged, demoted, suspended, threatened, harassed, or in any other matter discriminated against for providing such information. An employee who alleges discharge or other discrimination for providing evidence of fraud may file a complaint with the Secretary of Labor and may be provided with compensatory damages, including:

- reinstatement with the same seniority status that the employee would have had;
- back pay with interest; and b.
- compensation for any special damages as a result of the discrimination. C.

4 **Criminal Penalties for Securities Fraud**

An individual who knowingly executes, or attempts to execute, securities fraud will be fined, imprisoned not more than 25 years, or both.

D. Title IX—White-Collar Crime Penalty Enhancements

Attempt and Conspiracy

An individual who attempts (conspires) to commit any white-collar offense will be subject to the penalties as pre-determined by the United States Sentencing Commission. This includes mail fraud, wire fraud, and violations of the Employee Retirement Income Security Act (ERISA).

2. Amendment to Sentencing Guidelines Related to Certain While-Collar Offenses

- The United States Sentencing Commission ("Sentencing Commission") will review and amend, as needed, the Federal Sentencing Guidelines and policy statements to carry out the provisions of the Attempt and Conspiracy Act. This includes ensuring that the sentencing guidelines and policy statements take into account the nature of any offense and that the corresponding penalties are commensurate with the provisions of the Act. In the event the Sentencing Commission determines a growing trend of a particular offense, it will review to determine if any modification to the sentencing guidelines or policy statements is necessary.
- The Sentencing Commission will review any additional aggravating or mitigating b. circumstances for a particular offense that could justify an exception to the existing sentencing ranges.

3. Failure of Corporate Officers to Certify Financial Reports

- Any issuer periodic report which contains financial statements that is filed with the U.S. Securities and Exchange Commission (SEC) must be accompanied by the following:
 - (1) A written statement that the periodic report fully complies with the Securities Exchange Act of 1934.
 - (2) A written statement that the information contained in the report fairly presents, in all material respects, the financial condition and operating results of the issuer.
 - (3) The written statements above must be signed by the chief executive officer and chief financial officer (or equivalent) of the issuer (who bear responsibility for these statements).
- b. Any party that certifies the periodic financial report and/or its content knowing that it does not satisfy all the requirements (outlined in 3.a above) shall be fined or be imprisoned. Specifically, a party who:
 - (1) Certifies any statement knowing that it does not comply with all requirements will be fined not more than \$1,000,000 and/or imprisoned not more than 10 years; or
 - (2) Willfully certifies any statement knowing that it does not comply with all requirements will be fined not more than \$5,000,0000 and/or imprisoned not more than 20 years.

E. Title XI—Corporate Fraud Accountability

1. Tampering With Record or Impeding an Official Proceeding

Any individual who alters, destroys, or conceals a document (record) with the intent to modify the document and its integrity or the availability of the document in an official proceeding shall be fined and/or subject to not more than a 20-year prison term.

2. Temporary Freeze Authority for the SEC

If during an investigation pertaining to potential violations of federal securities laws by an issuer of publicly traded securities (or a director, officer, or employee acting on its behalf) the SEC determines it is likely that the issuer will be required to make penalty payments, the SEC may petition a federal district court to require the issuer to escrow the payments in an interest-bearing account for 45 days.

3. Authority of the SEC to Prohibit Persons From Serving as Officers or Directors

For any cease-and-desist proceedings, the SEC may issue an order to conditionally or unconditionally prohibit an individual from serving as an officer or director of the issuer for a stipulated period (or permanently) if that individual has violated securities rules and regulations and the SEC determines that this individual is unfit to continue to serve as an officer or director of the issuer.

4. Retaliation Against Informants Whistle-blower protection

Any individual who knowingly takes any harmful action against another person with the intent to retaliate for that person providing truthful information to the SEC regarding a possible federal offense shall be fined and/or imprisoned for not more than 10 years.

C050

INTERNAL CONTROL - Avoid financial reporting "CRIME"

The Committee on Sponsoring Organizations (COSO), an independent private sector initiative, was initially established in the mid-1980s to study the factors that lead to fraudulent financial reporting. The private "sponsoring organizations" include the five major financial professional associations in the United States: The American Accounting Association (AAA), the American Institute of Certified Public Accountants (AICPA), the Financial Executives Institute (FEI), the Institute of Internal Auditors (IIA), and the Institute of Management Accountants (IMA).

Best

In 1992, the COSO issued Internal Control—Integrated Framework (Framework) to assist practices organizations in developing comprehensive assessments of internal control effectiveness. The framework was subsequently updated in 2006, 2009, and 2013.

> A significant enhancement to the 2013 update was the formalization of fundamental concepts that were part of the original 1992 framework. Specifically, these fundamental concepts have evolved into 17 principles that have been categorized within the five major internal control components. The COSO's framework is widely regarded as an appropriate and comprehensive basis to document the assessment of internal controls over financial reporting. Management/board

Introduction to the COSO Framework Used by

Stockholders The framework is used by company management and its board of directors to obtain an initial understanding of what constitutes an effective system of internal control and to provide insight as to when internal controls are being properly applied within the organization. The framework also provides confidence to external stakeholders that an organization has a system of internal control in place that is conducive to achieving its objectives.

PASS KEY

An effective system of internal control requires more than adherence to policies and procedures by management, the board of directors, and the internal auditors. It requires the use of judgment in determining the sufficiency of controls, in applying the proper controls, and in assessing the effectiveness of the system of internal controls. The principles-based approach of the framework supports the emphasis on the importance of management judgment.

Application to Management and Board

The framework assists an entity's management and board of directors in the following areas:

- a. Effectively applying internal control within the overall organization, on a divisional (operating) unit level, or at a functional level.
- Determining the requirements of an effective system of internal control by h ascertaining whether the components and principles exist and are functioning properly.
- Allowing judgment and flexibility in the design and implementation of the system of internal control within all operational and functional areas of the organization.
- Identifying and analyzing risks and then developing acceptable actions to mitigate d. or minimize these risks to an acceptable level.
- Eliminating redundant, ineffective, or inefficient controls. e.
- f. Extending internal control application beyond an organization's financial reporting.

Efficient & effective operation Compliance with laws

2. Application to Stakeholders

The framework also provides value to external stakeholders and other parties that interact with the organization by providing:

- a. Greater understanding of what constitutes an effective system of internal controls.
- b. Greater <u>confidence</u> that management will be able to eliminate ineffective, redundant, or inefficient controls.
- c. Greater <u>confidence</u> that the board has effective oversight of the organization's internal controls.
- d. Improved confidence that the organization will achieve its stated objectives and will be capable of identifying, analyzing, and responding to risks affecting the organization.

B. Definition of Internal Control

*

Internal control is a process that is designed and implemented by an organization's management, board of directors and other employees to provide reasonable assurance that it will achieve its compliance, operating, and reporting objectives.

Memorize! C. Framework Objectives (3)

There are three *categories* of *objectives* within the framework.

1. Operations Objectives

Operations objectives relate to the effectiveness and efficiency of an entity's operations. This category includes financial and operational performance goals as well as ensuring that the assets of the organization are adequately safeguarded against potential losses.



2. Reporting Objectives "Focus of COSO"

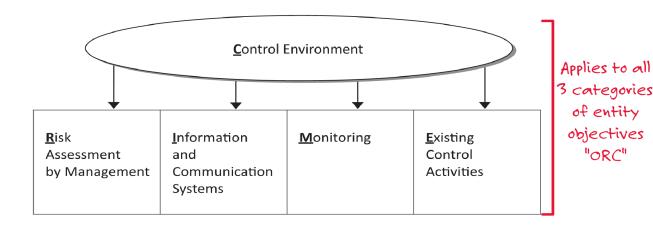
Reporting objectives pertain to the <u>reliability</u>, <u>timeliness</u>, and <u>transparency</u> of an entity's external and internal financial and nonfinancial reporting as established by regulators, accounting standard setters, or the firm's internal policies.

3. Compliance Objectives

Compliance objectives are established to ensure the entity is adhering to all applicable laws and regulations.

D. Components of Internal Control (CRIME)

There are five integrated *components* of internal control, including the control environment, risk assessment, information and communication, monitoring activities, and (existing) control activities. These components are needed to achieve the three *objectives* of internal control. Each component has associated *principles* that represent fundamental concepts.



PASS KEY

Identifying the components of the framework has been a subject of released questions. Remember that it would be a **CRIME** if you forgot these five components:

- c Control Environment Tone at the top ethics
- R Risk Assessment F/S misstated or fraud
- Information and Communication Fair, Accurate, Complete, Timely
- Monitoring Efficiencies of internal controls, report deficiencies
- E (Existing) Control Activities Policies/procedures to mitigate risk

(C) RIME

Memorize!

Control Environment "Tone at the top" "EBOCA"

The control environment includes the processes, structures, and standards that provide the foundation for an entity to establish a system of internal control. The importance of internal control and expected standards of conduct are established through a "tone at the top" approach taken by the senior management and board of directors of an entity. The five principles related to the control environment are:

a. Commitment to Ethics and Integrity

There is a commitment to ethical values and overall integrity throughout the organization.

b. Board Independence and Oversight

The board is independent from management and oversees the development and performance of internal control.

c. Organizational Structure

Management establishes an organizational structure, including reporting lines, authorities, and responsibilities, that is appropriate to the organization's objectives.

d. Commitment to Competence

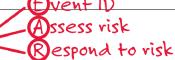
There is a commitment to hire, develop, and retain competent employees.

e. Accountability

Individuals are held accountable for their internal control responsibilities.



2. Risk Assessment



Risk assessment is an entity's identification and analysis of risks to the achievement of its objectives. The four principles related to risk assessment are:

a. Specify Objectives

The organization creates objectives that allow for identification and assessment of the risks related to those objectives.

b. (Identify and Analyze Risks)

The organization identifies risks across the entity and analyzes risks in order to determine how the risks should be managed.

c. Consider Potential for Fraud

The organization considers the potential for fraud in assessing risks.

d. Identify and Assess Changes

The organization identifies and assesses changes that could significantly impact the system of internal control.

CRIME

3. Information and Communication Between internal and external parties

Information and communication systems support the identification, capture, and exchange of information in a timely and useful manner. The three principles related to information and communications are: ${}^{\parallel}$

a. Obtain and Use Information

The organization obtains or generates and uses relevant, high-quality information to support the functioning of internal control.

b. Internally Communicate Information - Internal audit, audit committee,

managemen

The organization internally communicates information necessary to support the functioning of internal controls, including relevant objectives and responsibilities.

c. Communicate with External Parties - CPA firm

The organization communicates with external parties regarding matters that affect the functioning of internal control.



4. <u>M</u>onitoring Activities

Monitoring is the <u>process of assessing the quality of internal control performance over time by assessing the design and operation of controls on a timely basis and taking the necessary corrective actions. The two principles related to monitoring activities are:</u>

Frequency of testing dictated by risk

— a. Ongoing and/or Separate Evaluations

The organization selects, develops, and performs ongoing and/or separate evaluations to ascertain whether the components of internal control are present and functioning.

b. Communication of Deficiencies - Report and correct deficiencies

The organization evaluates and communicates internal control deficiencies in a timely manner to parties responsible for taking corrective action.



5. (Existing) Control Activities To mitigate risk

Control activities are set forth by an entity's policies and procedures to ensure that the directives initiated by management to mitigate risks are performed.

Control activities may be detective or preventative in nature and may include automated and manual activities (e.g., approvals, reconciliations, verifications). Segregation of duties is usually part of the control activities developed by an organization, and when not practical, management should develop alternative controls. The three principles related to control activities are:

a. Select and Develop Control Activities

The organization selects and develops control activities that contribute to the mitigation of risks to acceptable levels.

b. Select and Develop Technology Controls

The organization selects and develops general control activities over technology to support the achievement of objectives.

c. Deployment of Policies and Procedures

The organization deploys control activities through policies that establish what is expected and procedures that <u>put policies into action</u>.



PASS KEY

The candidate should be familiar with the five components of internal control (in bold) and each of the 17 principles within the components.

Control Environment

- Commitment to ethical values and integrity
- Board independence and oversight
- Organizational structure
- Commitment to competence
- Accountability

Risk Assessment

- Specify objectives
- Identify and analyze risks
- Consider the potential for fraud
- Identify and assess changes

Information and Communication

- Obtain and use information
- Internally communicate information
- Communicate with external parties

Monitoring Activities

- Ongoing and/or separate evaluations
- Communication of deficiencies

(Existing) Control Activities

- Select and develop control activities
- Select and develop technology controls
- Deploy through **p**olicies and procedures

E. COSO Cube

"ORC"

"CRIME"

There is a direct relationship between an entity's three objectives, its five integrated internal control components, and the organizational structure of the entity. This three-dimensional direct relationship is depicted in the COSO Cube. The three categories of objectives (operations, reporting, and compliance) are shown as columns on the Cube, while the five internal control components (control environment, risk assessment, control activities, information and communication, and monitoring activities) are depicted as rows. Additionally, the entity's organizational structure (entity level, division, operating unit, and function) is shown on the Cube as a third dimension.



F. Effective Internal Control

1. General Requirements

The framework indicates that an effective system of internal control provides reasonable assurance that the entity's objectives will be achieved. Under the framework, an effective system of internal control requires:

a. All 5 components and 17 principles that are relevant to be both *present* and *functioning*.

(1) Present

Mamariza

The term "present" means that the components and relevant principles are included in the design and implementation of the internal control system.

(2) Functioning

The term "functioning" demonstrates that the components and relevant principles are currently operating as designed in the internal control system.

* b. That all 5 components operate together as an *integrated system*, in order to reduce to an acceptable level, the risk that the entity will not achieve its objectives.

2. Specific Requirements

To be considered an effective system of internal control, senior management and the board must have reasonable assurance that the entity:

- a. Achieves effective and efficient operations when:
 - (1) external threats are considered unlikely to have a significant impact on the achievement of objectives; or
 - (2) the organization can reasonably predict and mitigate the impact of external events to an acceptable level.
- b. Understands the extent to which operations are managed effectively and efficiently when:
 - (1) external events may have a significant effect on the achievement of objectives; or
 - (2) the organization can reasonably predict and mitigate the impact of external events to an acceptable level.
- c. Complies with all applicable rules, regulations, external standards, and laws.
- d. Prepares reports that are in conformity with the entity's reporting objectives and all applicable standards, rules, and regulations.

PASS KEY

The framework requires judgment in designing, implementing, and conducting internal control and in assessing the effectiveness of internal control.

3. Ineffective Internal Control—COSO

Amajor deficiency represents a material internal control deficiency or combination of deficiencies that significantly reduces the likelihood that an organization can achieve its objectives.

When a major deficiency is identified pertaining to the presence and functioning of a component or relevant principle, or with respect to the components operating together in an integrated manner, the entity may not conclude that it has met the requirements for an effective internal control system under the COSO framework.

G. COSO Framework vs. Audit Framework

While the five components of the COSO framework are useful for identifying and evaluating an entity's internal controls in an audit context, an external auditor focuses on how a given control prevents or detects and corrects material misstatements in the entity's financial reporting.

Under auditing standards, there are three categories of internal control deficiencies that may be identified, including a (control) deficiency, significant deficiency, and material weakness. (Please refer to the Auditing 5 lecture for more detail on each of these three definitions.)

H. Internal Control (Framework) Limitations - No guarantee

Although internal control provides reasonable assurance that a firm will achieve its stated objectives, it does not prevent bad decisions or eliminate all external events that may prevent the achievement of the entity's operational goals. The following are inherent limitations that may exist even in an effective internal control system:

- 1. Breakdowns in internal control due to errors or human failure
- 2. Faulty or biased judgment used in decision making
- 3. Issues relating to the suitability of the entity's objectives
- 4. External events beyond the control of the entity
- 5. Circumvention of controls through collusion
- 6. Management override of internal controls



IV. ENTERPRISE RISK MANAGEMENT - Strategy - balance risk & return

According to COSO, "Risk is the possibility that an event will occur and adversely affect the achievement of objectives."

In 2004, the COSO issued *Enterprise Risk Management (ERM)*—<u>Integrated Framework</u> ("the framework") to assist organizations in developing a comprehensive response to risk management.

- The underlying premise of ERM is that every entity exists to provide value for stakeholders, that all entities face uncertainty (risk), and that management must determine how much uncertainty to accept as it strives to grow stakeholder value.
- The intent of ERM is to allow management to effectively deal with uncertainty, evaluate risk acceptance, and build value.
- Value is maximized when strategy balances risks and returns as well as efficiency and effectiveness in accomplishing objectives.

Each enterprise is unique and has its own individual features. The ERM framework helps identify those features.

A. Introduction

The COSO defines enterprise risk management as follows:

Enterprise risk management is a process, effected by an entity's board of directors, management, and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives.

The ERM framework encompasses the following themes:

1. Aligning Risk Appetite and Strategy

Organizations set strategy and objectives based on their individual willingness to bear risk. The levels and types of risk, including the mechanisms used to manage risk, are important themes in ERM.

2. Enhancing Risk Response Decisions

ERM provides a framework that can be used to evaluate how an organization will respond to risk and how to improve the effectiveness of risk decision making.

3. Reducing Operational Surprises and Losses

ERM devotes time to event identification Events may be positive (opportunities) or negative (risks). The early identification of events and the establishment of responses to those events reduce surprises and losses or lost opportunities.

4. Identifying and Managing Multiple and Cross-Enterprise Risks

The character of risks changes when viewed from an entity-wide perspective through to the division and business unit levels. Applying the framework at each level identifies unique and common risks which helps management identify appropriate responses.

5. Seizing Opportunities

Management can better capitalize on opportunities when they know their own entity's strengths and weaknesses and how to use them to maximize profitable opportunities.

B3 6.

Improving Deployment of Capital

Management can <u>maximize the efficiency and effectiveness of capital investments</u> when it has identified the maximum level of risk for a given capital investment.

В. **Objectives** S+ORC

ERM defines enterprise objectives in four categories:

- Strategic—High-level goals designed to achieve the mission.
- 2. Operations—Achievement of objectives through the effective and efficient use of resources.
- 3. Reporting—Achievement of reliable and consistent reporting.
- Compliance—Ensuring compliance with laws and regulations. Beyond just financial 4.
- C. **Components of Enterprise Risk Management**

reporting objectives

ERM includes components that are similar to the components of the COSO Internal Control Framework but are somewhat broader in scope. The components of ERM are supported by key elements. The components of ERM are as follows:

- (Internal environment (()RIME
- Satting objectives 4 categories "SORC"
- E)ent identification
- Assessment of risk (RIME
- Risk response
- Control adtivities CRIM(E
- Information and communication CR(I
- Monitoring CRI(M

PASS KEY

Knowing the logical order of the enterprise risk management framework has been a topic of released questions. Memorize the sequence of the components as: IS EAR AIM.

- I Internal environment E Event identification A Activities (control)
- ≤ <u>S</u>etting objectives A Assessment of risk I Information and communication
 - R Risk response M Monitoring

RIME

"EBOCA" HR Internal Environment - Tone at the top

The internal environment component of ERM is similar to the control environment of the Internal Control Framework and defines the tone of the organization. The internal environment component is supported by eight key elements.

Commitment to Ethical Values and Integrity

Adoption and demonstration of high ethical values by management will shape the internal environment.

(B) ard Oversight

The appropriate oversight provided by the Board of Directors establishes an organization-wide tone that recognizes their authority and promotes accountability of management.

c. Oganizational Structure

The organizational structure should support the entity's enterprise risk management system.

d. Commitment to Competence

Management's specification of required competency levels for each job function establishes the organization-wide expectation of individual and thus corporate competence.

e. (A)countability

The degree to which individuals are given appropriate authority to handle their responsibilities and the degree to which they are held accountable influences the internal environment.

f. Risk Management Philosophy Aggressive or conservative

The shared beliefs and attitudes of management that impact the entire organization are defined by the risk management philosophy.

g. Human Resources Standards Hive, train, evaluate, compensate,

The commitment to hiring the most qualified people will influence the internal environment. Minimum educational and work experience requirements, background checks, and the like demonstrate human resource commitment and facilitate individual and corporate accountability for new employee hires.

h. Risk Appetite

The amount of risk an organization will accept in the pursuit of value maximization is defined by risk appetite. Risk appetite factors heavily into balancing strategy with return.

2. Objective Setting "SORC"

Organizations set objectives and then identify the events that may prevent the achievement of those objectives. Objective setting is supported by the following key elements:

a. Srategic Objectives

The broad, mission-driven objectives of an organization are its strategic objectives. Strategic objectives are established for a longer corporate time frame while the related objectives and the selected objectives are more dynamic.

b. Related Objectives

Strategic objectives are supported by related objectives that help to identify critical success factors at each level of business operation. Related objectives generally fall into the three categories:

(1) Operations Objectives

Operations objectives include efficiency, effectiveness, and profitability goals that are subject to management discretion or style.

(2) (Reporting Objectives

External and internal reporting objectives are associated with both financial and nonfinancial data. It is paramount that all reporting be done on a timely basis and that all information contained in the individual reports be accurate.

HR

(3) Compliance Objectives

Compliance objectives include adherence to the laws, rules, and regulations associated with operations, including tax and financial reporting compliance, workplace safety, environmental regulations, and other laws.

EXAMPLE

Perfume International Company (PIC) produces colognes and fragrances for high-end retail stores and the discount retailer market. The company has three divisions including men's colognes, women's perfumes, and unisex body fragrances. Over the past five years, senior management has had the following three core *strategic objectives*:

- Expand customer base
- Reduce cost inefficiencies
- Maximize profits through new product offerings and further globalization of the company's products.

Current operating objectives for the men's cologne division are to successfully integrate its new cost reduction program. With the recent increase in division R&D, the men's cologne division is expected to introduce two new product offerings in the high-end European market. Further, the division's goal is to increase its operating profit by a minimum of 5 percent from the prior operating year.

The company's *reporting objectives* are to improve initial compilation errors and to distribute internal financial reports to division managers within five days of each month-end.

PIC's *compliance objectives* are to improve the response time on compliance follow up issues received from regulatory agencies, file external company tax returns on a more timely basis, and to further integrate software programs to more efficiently address ongoing compliance, legal and regulatory requirements.

c. Selected Objectives

Objectives ultimately selected and implemented by the organization must not only support the mission, but should also <u>align with the entity's risk appetite</u>.

d. Risk Appetite

Management establishes the risk appetite of the entity with the oversight of the board of directors. The entity's risk appetite is the benchmark for strategy setting. It is the theoretical balance of willingness to accept risk in order to achieve return and growth. Risk appetite is sometimes expressed as a risk-adjusted shareholder value-added measure. Risk appetite impacts strategy, which in turn impacts resource allocation.

e. Risk Tolerances

An organization's risk tolerance is the accepted level of variation relative to the achievement of objectives. Risk tolerance is measured in the same units as those used to measure the related objective.



3. Event Identification Internal & external risks

Events, both negative (risks) and positive (opportunities) should be identified. Event identification is supported by the following key elements:

a. Events

Events are at the core of risk assessment processes. An *event* is an internal or external occurrence that impacts strategy or the achievement of objectives. Events may be either positive or negative and may or may not happen. It is the uncertainty of the event along with its potential severity or benefit that drives the risk assessment and response process.

b. Influencing Factors

Event identification recognizes that occurrences can come from anywhere. Events can be external such as economic (recession), natural (storms), and social (changes in society). Events might also be internal such as technology choices, personnel, etc.

c. Event Identification Techniques

Many methods can be used to identify events. Workshops and brainstorming sessions might be useful in some instances. Analytics applied to data including trend analysis might also be used. Event identification techniques may include:

(1) Event Inventories

Lists of potential events common to companies in a particular industry.

(2) Internal Analysis

Analysis performed by internal staff as part of business planning.

(3) Escalation or Threshold Triggers

Comparison of activity to predefined criteria may trigger identification of events (e.g., variances from standards).

EXAMPLE

Construction Materials, Inc. manufactures a variety of building materials used by home builders. Given that the company's business revenues are impacted by U.S. regional economic conditions, management uses two primary methods to identify a weakness in a region's economic activity.

The first method used is the rolling four quarter unemployment (%) change subdivided by geographic regions. If a region's unemployment rate increases by 35 basis points (threshold trigger), a study is performed to determine if production levels should be reduced at the regional manufacturing facility.

The second method used is trend analysis on regional new home construction sales. In order to determine the impact on production levels for a particular region, the company analyzes actual quarterly data versus the prior comparable year's period and the current operating plan. Based on the results of this internal analysis, the company will determine whether production levels should remain constant, increase or decrease.

d. Event Interdependencies

Event identification considers event interdependencies. For example, changes in interest rates might impact exchange rates, which could change supplier costs or foreign demand.

e. Event Categories

Events might be categorized in any number of ways to ensure comprehensive consideration of potential events.

- (1) External
 - (a) Economic
 - (b) Natural Environment
 - (c) Political
 - (d) Social
 - (e) Technological
- (2) Internal
 - (a) Infrastructure (e.g., assets, capital, and other resources)
 - (b) Personnel
 - (c) Process
 - (d) Technology

f. Distinguishing Risks and Opportunities

(1) Negative events that prevent achievement of objectives are risks.

EXAMPLE

A fire at one of the company's major plants reduces operating production by 20 percent, resulting in the company's inability to meet its profitability objectives (goals) for the operating year.

(2) Positive events that promote achievement of objectives are opportunities.

EXAMPLE

The improvement in local economic conditions has resulted in more demand for the company's products and an expansion of its customer base.



4. Risk Assessment EAR

Risks are analyzed in relation to their likelihood and their severity and the anticipated risks that continue even after management has taken action. Risk assessment is supported by the following key elements:

a. Inherent and Residual Risk

- (1) *Inherent risk* is the risk to an organization that exists if management takes no action to change the likelihood or impact of an adverse event.
- (2) Residual risk is the risk to an organization that exists after management takes action to mitigate the adverse impact of the event.

b. Establishing Likelihood and Impact

- (1) Likelihood of an event is the probability that an event might occur.
- (2) Impact of an event is the consequence of its occurrence. Impact is alternatively referred to as severity or seriousness.
- (3) In establishing the likelihood and impact of events, managers should use the same time horizon as strategic plans.

c. Data Sources

Data sources are generally drawn from past experience with similar events. Data sources may include relevant economic data trends, historical industry information, or past company (data) experience.

d. Assessment Techniques

Assessment techniques include empirical and intuitive methods such as:

(1) Benchmarking

Use of common data from organizations with similar characteristics.

- (2) Probabilistic Models Statistical data more objective

 Use of a range of events and impacts with likelihood estimated using "historical" assumptions.
- (3) Non-probabilistic Models Opinion outcome of lawsuit

 Use of subjective assumptions to estimate event impact without estimating likelihood.

e. Event Relationships

Management must determine if individual events correlate or are unrelated.

EXAMPLE

Workers in a production facility declared a strike on Wednesday morning. Late Wednesday afternoon, the facility experienced a power outage in the assembly line section of the building that lasted two days. Management needs to determine whether these two events are related. They should consider whether the striking employees or their sympathizers may have sabotaged the equipment. Of course, it is possible the two events are unrelated.

CRIME 5. Risk Response EAR

Management's response to risk must align with the organization's overall risk appetite. Risk response is supported by the following key elements:

a. Evaluating Possible Responses

Management will generally respond to risk in one of four ways.

(1) Avoidance

Management may elect to avoid or terminate risk.

EXAMPLE

A company with an underperforming product line decides to discontinue the underperforming product line instead of taking steps to improve its performance.

(2) Reduction

Management may elect to reduce or mitigate risk.

EXAMPLE

A company that has had past inventory shortages may elect to invest in inventory technology to more closely monitor inventory levels and avoid the risk of stockouts.

(3) Sharing

Management may reduce risk by transferring risk.

EXAMPLE

A company that produces perishable food items decides to buy insurance to cover potential losses from spoilage.

(4) Acceptance

The company may take no action.

EXAMPLE

XYZ Company produces widgets which are currently in high demand. Instead of expanding its production capacity to accommodate higher order volumes, the company takes no action and is content with the daily production of widgets generated from its sole operating plant.

b. Selected Responses

Management selects a response from the four alternatives above.

c. Portfolio View

Risk should be considered entity-wide using a portfolio perspective. Ultimately, entities must review their total residual risk in comparison to risk tolerances. Simply put, once the organization has done all it can do, is the potential return worth the risk?

EXAMPLE

ABC Company has recently completed its annual strategy planning meeting for the upcoming year. During the meeting management identified three key risk factors (RF) including:

RF No. 1: Aging equipment could lead to expensive repairs and downtime to production equipment.

RF No. 2: A significant increase in shipping costs could erode profit margins. Currently, the company uses its own trucks for transporting all local and regional orders.

RF No. 3: Several of the company's key product inputs (materials) are subject to commodity pricing volatility.

After evaluating these risk factors, management has decided to pursue the following risk responses:

Response to RF No. 1: Management has decided to *accept the risk* associated with the aging equipment and take no action at this time. The rationale used is that the existing machines continue to be functional, there is no money available in next year's operating budget to perform material upgrades on the machines, and the company's five-year strategic plan includes a replacement of all existing production equipment. The company's risk tolerance for production downtime is up to 5 percent of the planned production levels.

Response to RF No. 2: Management will pursue a sharing (transferring) risk strategy by hiring a transportation management company (IEC, Inc.) that will provide driver training, accident management, truck repairs and replacement, and other services for a fixed annual fee. If the actual costs are less than the annual fixed fee IEC benefits; if the actual costs exceed the fixed annual fee, IEC pays the excess. ABC Company now has a completely predictable fixed cost per year.

Response to RF No. 3: ABC will attempt to mitigate this commodity price risk by using a *risk reduction approach* and making further use of hedging vehicles such as futures and forward contracts.



6. Control Activities

Control activities are the policies and procedures used to effect management's response to risk.

a. Integration with Risk Response

Policies and procedures should mirror the actions anticipated by the risk response and should be anticipated to be effective.

b. Types of Control Activities

The ERM identifies numerous types of control activities that might be used to fully respond to risk. The activities include:

(1) Top-Level Reviews - Variance analysis

Review of major initiatives and budget vs. actual performance by senior executive managers.

Direct Function or Activity Management

Review of performance reports and reconciliations by operating managers to ensure the transactions and other operations are executed as prescribed.

Information Processing (3)

Use of common information processing controls such as edit checks, batch totals, etc.

(4) Physical Controls

Assets are kept in physically secure locations. A company's legal documents including lending agreements, customer contracts, investment documents, and leases should be kept in a locked fire-proof vault.

Performance Indicators "Red flags" Ratio analysis

An assigned employee or manager should compare financial or operating results to predetermined standards. Any material variances should be investigated by the assigned employee.

(6) Segregation of Duties

There should be adequate segregation of the authorization, record keeping, and custodial functions to ensure that no one individual can control a transaction from beginning to end and thereby manipulate results.

Controls Over Information Systems

- General controls deal with infrastructure, security management, software acquisition, etc.
- (2) Application controls focus directly on data capture and processing.

d. **Entity Specific Controls**

Controls that are put in place should be specific to the (control) needs of each entity and be impacted by the size and complexity of the organization and its processes.

Information and Communication A(1)M



Information and communication includes the identification, capture, and communication of information throughout the organization in an effective manner. "FACT"

Information

Information is needed at all levels of the organization to manage risks.

Strategic and Integrated Systems

Improved technologies integrate internal and external communications.

(2) Integration with Operations

Information systems must fully integrate with operations to be effective.

Depth and Timeliness of Information

Information systems must capture data in the level of detail necessary to make decisions (reduce risk) and in sufficient time to make a difference.

(4) Information Quality "FACT"

Effective information generally has the following qualities:

- (a) Appropriate content as it pertains to the user(s) of the information;
- (b) *Timely* production to meet the needs of the function and/or user;
- (c) Current information which includes periodic updates;
- (d) Accurate information that includes reviews by independent parties; and
- (e) Accessible to the users who need the information to carry out their job responsibilities.

b. Communication

(1) Internal

Management provides specific and directed communications that convey the behavioral responsibilities of personnel.

(2) External

Effective external communication is required to ensure that <u>supplier</u> and <u>customer feedback</u> can provide input to product or service design.

(3) Means of Communication

Communication can use any number of media (e-mail, formal correspondence, social networking sites, or bulletin boards). Appropriate media is a matter of judgment.



3. <u>Monitoring</u>



Monitoring should be used to manage risk.

a. Ongoing Monitoring Activities - Dictated by risk

Operating or functional support managers provide ongoing monitoring activity to verify the effective operation of controls.

b. Separate Evaluations

A fresh look at the effectiveness of internal controls can be highly valuable. <u>Internal audit staff</u> or ad hoc teams can conduct the evaluation.

c. Reporting Deficiencies

Deficiencies in the operation of risk management procedures are generally reported through the normal chain of command but may require special treatment given the nature and character of the finding.

D. Effectiveness

1. Elements of Effectiveness IS EAR AIM

- a. <u>Each component of enterprise risk management must be present and functioning.</u>
 The components are the effectiveness criteria.
- b. There can be <u>no material weaknesses for enterprise risk management to be considered effective.</u>

2. Significance of Effective Enterprise Risk Management

Management and the board of directors have reasonable assurance that:

- a. They understand the extent to which the entity's strategic and operating objectives are being achieved.
- b. Reporting is reliable and applicable laws and regulations are being complied with.

E. (Limitations)

Enterprise risk management is an outstanding tool, but it is subject to human judgment ERM evaluations could be made in error and managers could override controls.

EXAMPLE

A company has established a control mechanism that requires the compliance department to prepare formal written responses to reporting, tax and environmental compliance issues within five business days of receiving compliance follow up requests. Although the compliance department has adhered to this control, the CFO has often not signed off on the compliance written correspondence in a timely manner (effectively overriding the control).

V. CHANGE CONTROL PROCESS

Change control management and processes consider the manner in which management monitors and authorizes changes to a variety of information technology matters including software application programs, system software, database administration, networks and security, and job scheduling.

A. Applying Change Management in Less Complex Computer Environments

Less complex operations generally relate to small companies that have implemented prepackaged applications without significant modifications. Although user configurations are possible, they do not impact the function of the applications.

on own

1. Selection and Deployment of Systems

- a. Senior management approves the selection of the system.
- b. Implementation follows the logical steps:
 - (1) Risk assessment is performed.
 - (2) Application controls are considered.
 - (3) Security requirements are considered.
 - (4) Data conversion requirements are developed.
 - (5) Testing is performed.
 - (6) Implementation is completed.
 - (7) Post implementation reviews are performed.

2. Patch Management Process

A software developer's updates to its system to eliminate system problems or to promote system efficiencies are known as patches. A patch is a system update that, in a figurative way, covers a hole.

- a. Patches are tested prior to implementation.
- b. Patches might be tested by third parties.
- c. Only authorized individuals are allowed to move changes into production and the function of making the change is segregated from the function of putting the change into production.

B. Applying Change Management in More Complex Computer Environments

More complex operations may relate to larger companies that involve a wider variety of changes than less complex operations.

- Complex computer environments may have the following characteristics:
 - a. Source code may be developed in house for critical applications.
 - b. Prepackaged software may have special customization to meet specific entity requirements.
- 2. Change management controls adapt to more sophisticated requirements.
 - a. Changes that require documentation are defined.
 - b. Access and updates to source code are managed with version control systems.
 - c. All significant changes are tested before being released into production.
 - Back out plans exist for changes that cannot be performed in segregated environments.
 - e. Only authorized individuals are permitted to move changes into production and that function is, where possible, segregated from the individual responsible for making the change.
 - f. Notification, evaluation, and documentation steps are performed by a system manager to resolve emergency change requests.
 - g. Where segregation of duties is not practical, management partitions servers into development, test, and production environments to mimic segregation of duties and reviews the operation of partitioned environments on a periodic basis.

"Accomplish goals"

OPERATIONS MANAGEMENT

Performance Management and Impact of Measures on Behavior Motivate

I. FINANCIAL AND NONFINANCIAL PERFORMANCE MEASURES - See balanced scorecard

Both *financial* and *nonfinancial measures* are ultimately designed to provide feedback that will motivate appropriate employee behaviors. Feedback tied to self-interest is most effective. The issue associated with any performance measurement system is the appropriate linkage of measures, incentives, and goals.

A. Financial Measures

Financial measures of performance include the following:

1. Profit

The amount of income generated after expenses.

B3 ← 2. Return on Investment ROA, ROE

Represents the income generated based on a specific investment. The measurement of return may be based on total assets available, total assets employed (minus current liabilities), or stockholders' equity.

3. Variance Analysis Spending

Involves a comparison of actual performance results with expected performance.

4. Balanced Scorecard

A framework used for implementing strategy that converts a company's strategic objectives into a set of performance measures.

(Note: The technical features of the measures are discussed in future chapters.)

- B. Nonfinancial Measures Including Benchmarking Techniques and Best Practices in General
 - 1. External Benchmarks—Productivity Measures Vaviance/efficiency

Productivity is defined as the measure of the ratio of the outputs achieved to the inputs of production. Productivity is a measure of efficiency and uses the relationships derived from actual performance in comparison to similar organizations over time. Two types of productivity ratios are generally recognized.

a. Total Factor Productivity Ratios (TFP) Total costs

Material & labor costs

Total factor productivity ratios (TFPs) reflect the quantity of all output produced relative to the costs of all inputs used. This ratio can be used to compare actual cost per unit production levels to budgeted (or a prior year's) production levels.

b. Partial Productivity Ratios (PPRs) Specific quantity

Material or labor quantity Partial productivity ratios (PPRs) reflect the quantity of output produced relative to the quantity of individual input(s) used. This ratio can be used to compare the actual levels of a production input needed to produce a given output, which may be used for a comparison with a budgeted (or a prior year's) input level. It is the most frequently used productivity measure.

EXAMPLE

Garden Furnishings Inc. produces outdoor garden sculptures for its high-end niche market. Each garden sculpture manufactured by the company includes two raw materials, with plastic being the largest product input. During the previous month, the company used 20,000 pounds of plastic and 5,000 pounds of cement to produce 1,000 garden sculptures. Material prices at time of production were \$1.25/lb. and \$1.75/lb. for plastic and cement, respectively.

Based on the above, the direct material (plastic) partial productivity ratio is calculated as follows:

PPR = Quantity of output produced / Quantity of input used

- = 1,000 units of garden sculptures / 20,000 lbs. of plastic
- = 0.05 sculpture units per lb. of plastic

Using the above, the total factor productivity ratio is calculated as follows:

TFP = Quantity of output produced / Costs of all inputs used

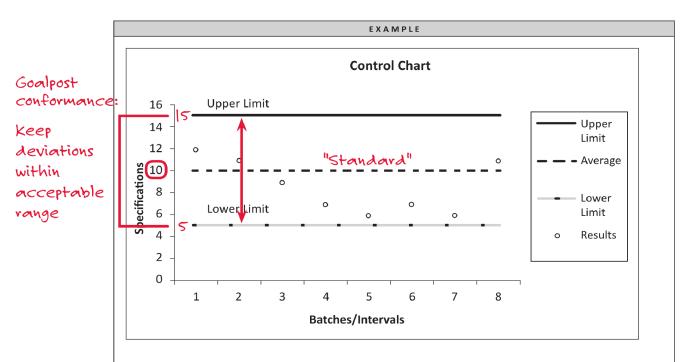
- = 1,000 garden sculptures / \$33,750
- = 0.02963 units of output per dollar of input cost

2. Internal Benchmarks—Techniques to Find and Analyze Problems

Internal benchmarks include a variety of techniques to find and analyze problems or measure performance. Among the most common quality monitoring and investigative techniques are the procedures described below.

a. Control Charts - Determine "zero" defects

Control charts are an important tool used in statistical quality control (SQC). This graphical tool is used to plot a comparison of actual results by batch or other suitable constant interval to an acceptable range Control charts show if there is a trend toward improved quality conformance or deteriorating quality conformance.



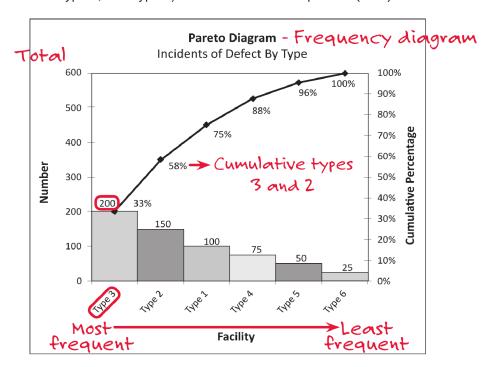
- The control chart above demonstrates how individual batches/intervals of production fall within a range
 of quality specifications that includes an acceptable upper limit of 15 occurrences to an acceptable lower
 limit of 5 occurrences, with production management establishing an average quality specification of 10
 occurrences per batch/interval.
- 2) To further extrapolate the results of the control chart above, assume that the company's machine makes batches of rubber tires, with each batch consisting of 10,000 truck tires. Given management's historical experience with this production line, the company has set an upper-end defect rate of 15 tires per batch. The company has also established a lower-end defect rate of 5 tires per batch, as any amount set lower could result in production machine breakdown and repairs.
- 3) The results graphically displayed on the control chart above indicate that the individual tire production batches/intervals are all within the upper (15) and lower (5) limit tire defect specifications for production. Furthermore, the pattern of production shows a general decline in defects as more batches were produced for each subsequent monthly time interval; the very last batch (No. 8) is an outlier with more tire defects (11) than the average of 10.

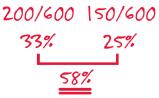
b. Pareto Diagrams "Histogram"

Pareto diagrams are used to determine the quality-control issues that are most frequent and often demand the greatest attention. A Pareto diagram demonstrates the frequency of defects from highest to lowest frequency.

(1) Interpretation

The Pareto diagram below shows the individual and cumulative frequency of six types of quality issues. Addressing half of the types of defects (Type 3, Type 2, and Type 1) would address three quarters (75%) of all defects.

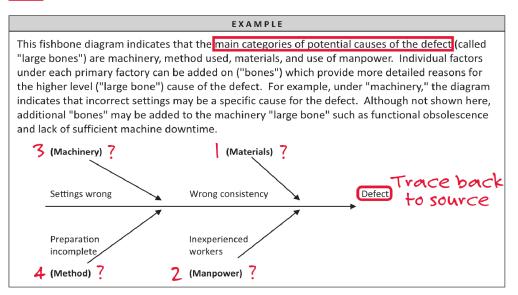




c. <u>Cause-and-Effect</u> (Fishbone) Diagram

Once the most frequently recurring and costly defects/problems are identified by the Pareto diagram, a cause-and-effect diagram may be used to further analyze the defect.

Cause-and-effect diagrams provide a framework for managers to analyze the problems that contribute to the occurrence of defects. Production processes that lead to the manufacture of an item are displayed along a production line in a manner that looks like a fishbone. Managers use the diagram to identify the sources of problems in the production process by resource and take corrective action.



C. Characteristics of Effective Performance Measures

Effective performance measures promote the achievement of *goals*. Typically, the characteristics of those measures:

- 1. relate to the goals of the organization;
- 2. balance long- and short-term issues;
- 3. reflect management of key activities, sometimes referred to as critical success factors in the balanced scorecard;
- 4. are under the control or influence of the employee;
- 5. are understood by the employee;
- 6. are used to both evaluate and reward the employee or otherwise constructively influence behavior;
- 7. are objective and easily measured; and
- 8. are used consistently.

II. IMPACT OF MARKETING PRACTICES ON PERFORMANCE

Marketing practices generally focus on one of five different elements, including the product, the market segment (which customer), the delivery system (e.g., wholesalers or retailers), the communication strategy, and the price. Marketing decisions must consider the objectives of management and the manner in which alternative practices will achieve those objectives.

A. Marketing Practices and Methods

Marketing seeks to establish value for an organization's products. Marketing decisions relate to the establishment of value and the methods used to promote and sell products to customers or prospective customers.

1. Transaction Marketing - Lowest price

Customers are attracted for the sake of a single sale for example, a used car sold purely based on price.

2. Interaction-Based Relationship Marketing - Repeat business/loyalty discounts

Customers are attracted for the purpose of a sale that serves as the basis for an ongoing relationship. For example, a new car sale emphasizes value with anticipation of repeat sales and ongoing service.

3. Database Marketing

Information is gathered on customers and the information from that database is used to segment customers into target markets for a more effective selling effort; for example, the sale of a specialty item such as vitamin supplements to target groups.

4. E-marketing

E-marketing is the use of the Internet to accomplish marketing functions.

5. Network Marketing

Network marketing, sometimes referred to as multilevel marketing, focuses on relationships and referrals to accomplish marketing functions.

B. Performance

Marketing methods are selected to efficiently promote and sell the product and to drive customer and employee behavior.

1. Marketing Methods Are Aligned With Products

As noted above, <u>certain products are compatible with specific marketing practices</u>. For example, transaction marketing techniques may be employed to attract customers to buy new or used automobiles, whereas network marketing may be used to sell vacation timeshares.

2. Performance and Performance Incentives

- a. Sales-volume driven compensation and evaluation methods are well-suited to transaction marketing that involves a single transaction. For example, car dealerships must sell a certain number of cars each month to achieve a desired level of inventory turnover and profitability. As a result, an individual salesperson's performance and incentives are tied to a predetermined level of car sales.
- b. Customer satisfaction and quality measures are more significant in relationshipbased marketing. For example, an insurance agency may use customer surveys to measure employee customer service performance.

III. (INCENTIVE) COMPENSATION Motivate, compensate, retain

A. Types of Compensation

Compensation for managers comes in many forms. Generally, there are three types:

Fixed salaries represent guaranteed periodic payments from an employer in a fixed amount. Fixed salaries are not a form of incentive compensation because they do not vary with performance.

2. Bonuses

Sales Expenses

Stock

Incremental increases in pay may be awarded and are often based on either profitor stock performance expectations.

- a. Profit-based bonuses provide incentives for employees to improve operating performance by increasing sales or decreasing expenses.
- b. Stock-based bonuses provide incentives for achieving positive market performance, reflected through higher stock prices.
 - (1) Stock-based bonuses are often structured as stock options.
 - (2) Options typically involve giving employees the right to buy a specified number of shares at a specified price within a future time period.

3. Other Incentives ("perks")

Employee perks provide employees with non-salary benefits such as the use of vacation homes, company jets and company cars, lawn maintenance, etc.

- Perks must be authorized by the board of directors and properly disclosed in proxy statements.
- b. Perks received that are not related to performing the manager's business activities may also need to be included in the taxable income of the manager. For example, a company jet used to travel to an out-of-state business conference is business-related, but a company jet used for a weekend vacation is not business-related and may be taxable.

B. Design Choices for Management Compensation

1. Time Horizon

Incentive compensation must balance employee focus on current rewards for current performance against the impact of current decisions on future performance.

- Cash bonuses reward current performance.
- b. Restricted stock options may reward current performance, but the plan emphasizes future performance.
 - (1) The employee must typically stay through the option vesting period. Retention
 - (2) The option only has value if the stock price increases.

2. Fixed vs. Variable Bonuses

Incentive programs may be fixed (formula driven) or variable (subjective).

- Objective a. Fixed programs provide predictable payouts to participants, but may be adversely affected by uncontrollable events.
 - b. Fixed plans are somewhat rigid and do not accommodate balanced scorecard presentations, which attempt to tie in an organization's mission or objectives with stipulated performance measures (and ultimately, compensation).

c. Variable bonus plans may be based on various performance criteria that contain subjective elements. For example, the variable bonus rate an employee receives may be based on whether a boss considers an employee an underperformer, an average performer, or a superior performer. The level of the employee's bonus also may be subject to his or her department achieving certain performance objectives.

3. Stock vs. Accounting-Based Performance Evaluation

Incentives can be driven by upward movement in the company's stock price or by accounting information such as achieving a desired sales volume, profit margin, or return on investment.

- Stock-based incentives align the manager's interests with the shareholders, but can create risk averse behavior.
- b. Stock-based incentives are often linked with accounting-based evaluations to balance current and future performance.

4. Local vs. Company-wide Performance

Rewards for division performance that erode company-wide performance do not contribute to entity-wide strategic objectives.

- a. Local performance might result in a fixed salary. Base
- b. Bonuses might result from company-wide performance. For example, a division manager receives a 25 percent cash salary bonus because the company's performance objectives were met, even though the manager's division performed poorly in relation to other divisions within the company.

5. Cooperative vs. Competitive Incentive Plans

Rewards may emphasize compensation for team performance or emphasize individual performance in relation to peers.

- a. Cooperative incentive plans may result in stock options for company-wide performance. Both the basis for the award and the type of award emphasize the corporate good. Manufacturers might consider cooperative incentives.
- b. Competitive incentive plans might result in tiered commission structures in which commission rates increase for individuals as thresholds are reached and exceeded. Car sales, insurance sales, etc., are ideal for competitive incentive plans.

EXAMPLE

Reflex Company hired two senior managers for their Production (Manager A) and Quality Control (Manager B) divisions.

Manager A was hired to improve the division's overall level of productivity (output), which has not met the CEO's expectations in recent years. Manager A's compensation plan is based on an annual fixed salary of \$175,000.

Manager B was hired to increase customer satisfaction associated with the company's products. Manager B's compensation plan consists of an annual base salary of \$50,000 with significant performance incentives that could result in a total salary in excess of \$200,000.

Manager A's salary is not directly tied to improving the division's productive output. Manager A will receive an annual base salary of \$175,000 whether or not the division's productivity is improved. In contrast, Manager B's compensation package is structured so that his or her performance must meet certain quality criteria in order to maximize compensation.

OPERATIONS MANAGEMENT

Cost Measurement Methods and Techniques

I. COST OBJECTS (or objectives) Product cost Uncome determination, Efficiency

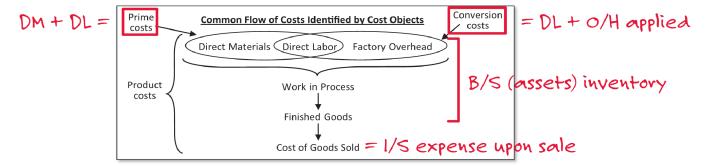
Cost objects (or cost objectives) are defined as resources or activities that serve as the basis for management decisions. Cost objects require separate cost measurement and may be products, product lines, departments, geographic territories, or any other classification that aids in decision making.

A. Focus of Cost Objectives

Integration of product costing with cost control measurement and assignment objectives maximizes the effectiveness of management accounting systems. Cost measurement and assignment may focus on valuation of product or inventory (i.e., product costing) or cost control (i.e., cost comparison to standards and budgets).

Tax vs. GAAP; internal vs. external

A single cost object can have more than one measurement. Inventory (product) costs for financial statements are usually different from costs reported for tax purposes. Both inventory (product) costs and costs reported for tax purposes are different from costs used by management to make decisions.



- B. Common Cost Objects and their Definitions
- * 1. Product Costs Not expensed until product sold matching principle

 Product costs are all costs related to the manufacturing of the product.
 - a. Inventory and Cost of Goods Manufactured and Sold

Product costs are inventoriable (i.e., considered as assets before the product is sold). These costs attach to the units of output.

b. Components

Product costs consist of <u>direct materials</u>, <u>direct labor</u>, and <u>manufacturing overhead</u> applied.

2. Period Costs 1/5 only

Period costs are expensed in the period in which they are incurred and are not inventoriable.

a. Expenses

Period costs include selling, general, and administrative expenses as well as interest (financing) expense

 \rightarrow O/H = IM, IL, Factory

b. Components

Period costs are the costs of selling the product and administering and managing the operations of the firm.

3. Manufacturing Costs (treated as product costs)

Manufacturing costs include all costs associated with the manufacture of a product.

a. Inventory and Cost of Goods Manufactured and Sold

Manufacturing costs are specifically capitalized to the cost of the manufactured product.

b. Components

Manufacturing costs consist of both direct and indirect costs (described below).

4. Nonmanufacturing Costs (treated as period costs) SG&A, interest

Nonmanufacturing costs are costs that do not relate to the manufacturing of a product. These costs (e.g., selling, general, and administrative expenses) are expensed in the period incurred.

PASS KEY

Cost accounting systems are designed to meet the goal of measuring cost objects or objectives. The most frequent objectives include:

- Product costing (inventory and cost of goods manufactured and sold)
- Income determination (profitability)
- Efficiency measurements (comparisons to standards)

"PIE'

EXAMPLE				
Thompson Manufacturing incurred the following cost	s during its recen	t fiscal year:		
Wages for factory employees	\$5,700,000	Product		
Wages for accounting department	840,000	Period		
Sales and promotion expense	325,000	Period		
Raw materials purchased	4,950,250	Product		
General and administrative costs	675,500	Period		
Manufacturing overhead = IM, IL, "Factor	1,100,000 اا	Product		
Interest expense	195,000	Period		
Based on the above, the company's product costs we	re as follows:			
Wages for factory employees	\$5,700,000			
Raw materials purchased	4,950,250			
Manufacturing overhead	1,100,000			
Total product costs	<u>\$11,750,250</u>			
The company's period costs were as follows:				
Wages for accounting department	\$840,000			
Sales and promotion expense	325,000			
General and administrative costs	675,500			
Interest expense	195,000			
Total period costs	\$ 2,035,500			



A direct cost can be easily (i.e., without excessive cost and without significant effort) traced to a cost pool or object, as the cost directly relates to that item. Common direct costs include:

Direct Raw Materials

Direct raw materials are the costs of materials purchased to be used in production (including freight in net of any applicable purchase discounts) plus a reasonable amount for normal scrap created by the process.

Direct Labor

Direct labor is the cost of the labor that is directly related to the production of the product or the performance of a service plus a reasonable amount of expected "down time" for the labor (e.g., breaks, setup, training, etc.).

EXAMPLE

Spud Furnishings Inc. manufactures custom couches. Raw materials (fabric or leather) used in the production process of a custom order (a couch) are considered direct materials and are easily traced to the cost object, the custom order. The time spent by the upholsterer to make the couch is considered direct labor and is also easily traced to the cost object, the custom order.

In the factory - product - manufacturing O/H In the Office - period - SG&A (Indirect) Costs

An indirect cost is not easily traceable to a cost pool or cost object. Indirect costs are typically incurred to benefit two or more cost pools or objects. The specific benefit each cost gives to the cost pool or object cannot be determined without making some sort of reasonable estimate or using an allocation methodology. Indirect costs are known as overhead. In the manufacturing business, such costs are classified as manufacturing overhead.

Indirect Materials

The category *indirect materials* covers the cost of materials that <u>were not used</u> specifically or could not be traced to the completed product with ease.

Spud Furnishings Inc. manufactures custom couches. In addition to the direct material for fabric, wood for framing, and springs it uses in the couches, the company purchases cleaning supplies used in the manufacturing area and small replacement parts for the manufacturing machines. These items are indirect materials that do not directly benefit any specific cost object. These costs are included in overhead.

Indirect Labor

Indirect labor is the cost of labor that is not easily traceable to a particular product, service, etc. Most often, this type of labor supports the manufacturing process but does not work directly on the specific job, etc.

EXAMPLE

Spud Furnishings Inc. manufactures custom couches. In addition to upholsterers, Spud Furnishings employs forklift drivers, maintenance workers, shift supervisors, workers in the receiving department, janitorial staff, inspectors, engineers, training, and other human resources staff. These costs are indirect labor and are included in manufacturing overhead.

3. Other Indirect Costs "In the factory"

Other indirect costs are indirect costs other than those for materials or labor.

EXAMPLE

Spud Furnishings incurs costs for depreciation of the facility and machinery, rent of the production warehouse, machine maintenance, property taxes on the building insurance rent utilities etc. These miscellaneous facility costs are *other indirect costs* and are included in *manufacturing overhead*.

PASS KEY

Prime cost = Direct labor + Direct material

Conversion cost = Direct labor + Manufacturing overhead

* C. Overhead Allocation Using Cost Drivers - Assign factory O/H to individual Indirect costs are allocated (assigned) to benefiting cost pools or cost objects using cost products

drivers that are considered to have a strong relationship to the incurrence of these costs.

1. Allocation Bases Direct labor \$ or hours, machine hours

The cost drivers that are used to allocate indirect costs are referred to as "allocation bases."

"Total mfg. O/H"

2. Accounting for Overhead

When traditional costing is used, all indirect costs are allocated to a single cost pool (or account) called "overhead" and allocated as a single pool. Overhead may also be allocated using activity-based costing, which will be discussed later in this lecture.

PASS KEY

Memorize!

When traditional costing is used, the application of overhead is accomplished in two steps:

Step 1: Calculated overhead rate = Budgeted overhead costs ÷ Estimated cost driver

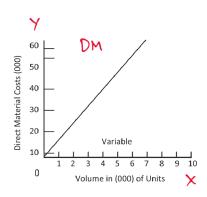
Step 2: Applied overhead = Actual cost driver x Overhead rate (from Step 1)

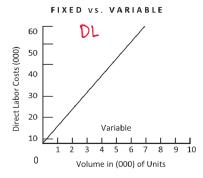
SI DL \$
DLH
MH

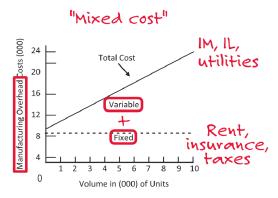
III. COST BEHAVIOR (fixed vs. variable)

"Linear"

Costs can be classified by their behavior, the degree to which the costs are either fixed or variable. Direct material and direct labor are generally variable costs while the indirect costs included consist of both fixed and variable components. *Cost behaviors* are graphically illustrated as follows:







A. Variable Cost

1. Behavior Total cost

A variable cost changes proportionally with the cost driver (e.g., typical cost drivers include sales volume and production volume).

2. Amount constant per unit total varies)

Variable costs change in total, but they remain constant per unit. As production volume increases (or decreases), the total variable cost will increase (or decrease), but the variable cost per unit will always remain the same.

3. Long-Run Characteristics

The short-run and long-run effects of variable costs are the same within relevant ranges (the range of production over which cost behavior assumptions are valid).

B. Fixed Cost

1. Behavior

Total

In the short term and within a relevant range, a fixed cost does <u>not change</u> when the cost driver changes.

2. Amount (varies per unit, total remains constant)

Rent = Fixed cost per unit

Fixed costs remain constant in total, but they vary per unit. As production volume increases (or decreases), fixed costs remain the same, but the cost per unit will decrease (or increase), respectively.

PASS KEY

The distinction between variable costs and fixed costs allows managers to determine the effect of a given percentage change in production output on costs. *Be careful!* The examiners often attempt to trick candidates by providing a fixed cost per unit for a given volume of production. As fixed costs are "fixed," the candidate must convert this format to a dollar amount that will not change as production volume changes within a relevant range.

3. Long-Run Characteristics

Given enough time (and a long enough relevant range), any cost can be considered variable.

EXAMPLE

Depreciation is typically a fixed cost in a relevant manufacturing range of units or up to production capacity but can be considered variable in the long run. A new building will have to be purchased if the production levels exceed plant capacity (thus, possibly increasing depreciation expense, depending on the extent to which other facilities have been depreciated).

C. Semi-variable Costs (mixed costs) = Mfg. O/H

Total cost includes

Costs frequently contain both fixed and variable components. Costs that include components that remain constant over the relevant range and include components that fluctuate in direct relation to production are classified as *semi-variable*.

в1-**43**

D. Cost Application Example On own

EXAMPLE

Quality Ornaments Inc. (QOI) manufactures collector porcelain figurines and holiday ornaments in its single manufacturing facility. During the recently completed operating year, the company incurred manufacturing labor costs of \$3,200,000 (including indirect labor of \$200,000, which includes a base annual contractual amount and a variable rate amount for hours worked above a contractual threshold), raw material costs of \$6,000,000, plant depreciation costs of \$440,000 (straight-line method used), electricity costs of \$250,000 (directly tied to hours of production), heating costs of \$100,000 (annual rate), and delivery expenses of \$25,000 (based on a formula per customer order). Additionally, QOI incurred \$10,000 in building and equipment maintenance and repair expense that includes both a fixed contractual amount for weekday maintenance and a variable rate amount for maintenance performed on Saturdays and holidays.

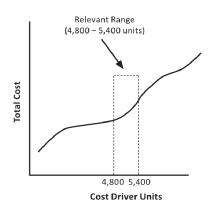
Based on the above scenario, calculate the company's variable costs, fixed costs, and semi-variable costs for the year.

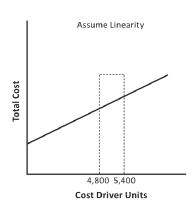
Solution:

Cost Item	Variable Costs	Fixed Costs	Semi-variable Costs
Direct labor	\$3,000,000		
Indirect labor			\$200,000
Raw materials	6,000,000		
Depreciation		\$440,000	
Electricity	250,000		
Heating		100,000	
Maintenance & Repair			10,000
Deliveries	<u>25,000</u>		
Total Costs	<u>\$9,275,000</u>	<u>\$540,000</u>	<u>\$210,000</u>

E. Relevant Range

The *relevant range* is the range for which the assumptions of the cost driver (i.e., linear relationship with the costs incurred) are valid. When the cost driver activity is no longer within the relevant range, the variable and fixed cost assumptions for that cost driver cannot be used to allocate costs to cost objects. Relevant range is graphically illustrated as follows:





F. Concept Example—Cost Behavior On own

Classify each transaction type by behavior. Answer assuming that transactions occur within the relevant range of an identified cost driver. Assume normal cost patterns.

C	ONCEPT EXAMPLE		
	<u>Variable</u>	<u>Fixed</u>	<u>Semi-Variable</u>
		8]Vavia Fixed
SALES	×		
Less: Returns and allowances	×		
COSTS OF SALES			
Direct material	×		
Direct labor	×		
Indirect labor			×
Fringe benefits (15% of labor)	×		×
Royalties (1% of product sales)	×		
Maintenance and repairs of building			×
Factory production supplies	×		
Depreciation—straight-line		×	
Electricity—used in the mfg. process	×	×	
Scrap and spoilage (normal)	×		
SELLING, GENERAL, AND ADMINISTRATIVE EXPENSE			
Sales commissions	×		
Officers' salaries		×	
Fringe benefits (relate to labor)	×	×	
Delivery expenses	×		
Advertising expenses (annual contract expenses)		×	

IV. COST ACCUMULATION SYSTEMS

Cost accumulation systems are used to assign costs to products. The system used is driven by the cost object involved. If the cost object is a custom order, job costing is used. If the cost object is a mass-produced homogeneous product (e.g., steel), process costing is used.

PASS KEY

Although the most commonly tested cost accumulation systems are job-order costing and process costing, there are many variations of cost accumulation systems that may appear on your examination:

- Operations costing uses components of both job-order costing and process costing.
- Backflush costing accounts for certain costs at the end of the process in circumstances where there is little need for in-process inventory valuation.

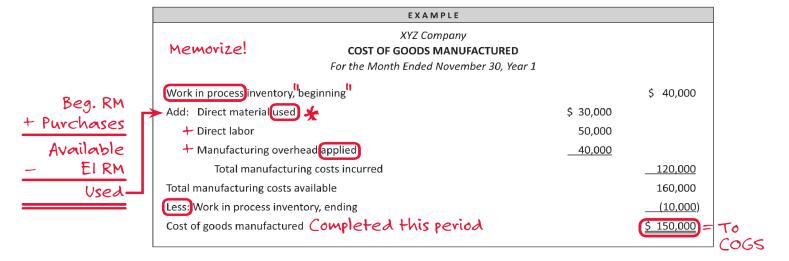
Life-cycle costing seeks to monitor costs throughout the product's life cycle and expand on the traditional costing systems that focus only on the manufacturing phase of a product's life.

V. COST OF GOODS MANUFACTURED AND SOLD

Production costs may be summarized in the form of "cost of goods manufactured statement" and a "cost of goods sold statement." These statements may be prepared separately or combined as a "cost of goods manufactured and sold statement."

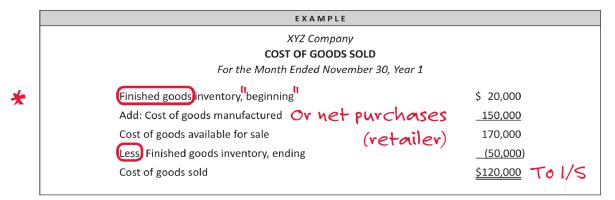
* A. Cost of Goods Manufactured

The cost of goods manufactured statement accounts for the manufacturing costs of the products completed during the period. These costs consist of direct material, direct labor, and manufacturing overhead costs. The manufacturing costs incurred during the period are increased or decreased by the net change in work in process inventory (beginning WIP minus ending WIP) to equal cost of goods manufactured. An example of a cost of goods manufactured statement follows:



B. Cost of Goods Sold

The cost of goods sold statement for a manufacturer is very similar to one prepared for a retailer except that cost of goods manufactured is used in place of purchases made during the period. An example of a cost of goods sold statement follows:



VI. JOB-ORDER COSTING (cost accumulation system)

Job-order costing (or job costing) is the method of product costing that identifies the job (or individual units or batches) as the cost objective and is used when there are relatively few units produced and when each unit is unique or easily identifiable.

A. Cost Objective Is the Job (or unit)

"Sequentially"

Under job-order costing, cost is allocated to a specific job as it moves through the manufacturing process. Record keeping for job-costing emphasizes the job as the cost objective.

B. Job-Cost Records

Job-cost records are maintained for each product, service, or batch of products, and they serve as the primary records used to accumulate all costs for the job. Job-cost records are also referred to as job-cost sheets or job orders. Job-cost records accumulate data from the following internal documents:

1. Materials Requisitions

Materials requisitions are documents showing materials requested for use on the job.

2. Labor Time Tickets (time cards)

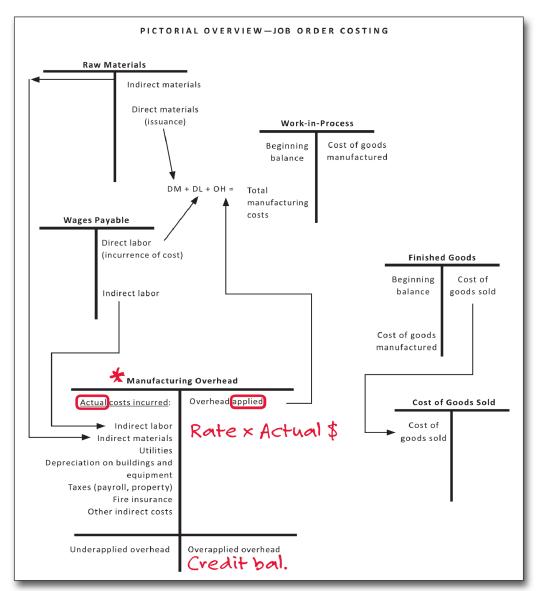
Labor time tickets (time cards) are documents that show the labor hours and labor rate associated with the time applied to the job.

3. Overview of Job-Order Costing

Job-costing systems require a limited number of work in process accounts.

EXAMPLE

Job-costing systems are best suited for customized production environments such as construction, aircraft assembly, printing, etc. A new job-cost record would be started every time a new job (building project, airplane, or print job) is started.



Favorable because applied > actual costs

VII. PROCESS COSTING (cost accumulation system)

Process costing is a method of product costing that averages costs and applies them to a large number of homogeneous items.

PASS KEY

Computation of how each segment of the process should compute cost of goods transferred out and the cost of goods remaining in work in process (inventory) is the central product costing issue in process costing environments. Five steps are normally followed to resolve this issue:

- 1. Summarize the flow of physical units (beginning with the production report).
- 2. Calculate "equivalent unit" output.
- 3. Accumulate the total costs to be accounted for (production report).
- 4. Calculate the unit costs based on total costs and equivalent units.
- 5. Apply the average costs to the units completed and the units remaining in ending work in process inventory.

A. Units and Costs Collected on a Production Report See next page

Costs incurred for a period as well as all units produced during that period are accumulated on a production report that accounts for the physical flow of units. The report includes the beginning inventory, the number of units started, the number of units completed, and the number of units remaining in inventory.

1. Unit (Quantity) Accounting

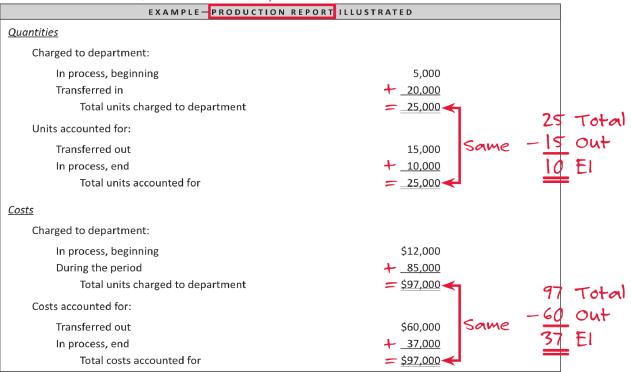
The number of units accounted for must equal the number of units charged to the department (or separate process).

2. Cost Accounting

The amount of costs accounted for must also equal the amount of costs charged to the department (or separate process).

PASS KEY The determination of the components of inventory cost can be confusing; however, with the use of the "BASE" mnemonic, it all gets a little easier! The following shows how the components "fit" together with the flow of activity: **Inventory: Raw Materials** Inventory: Work in Process **Inventory: Finished Goods B** Beginning inventory of raw **B** Beginning inventory of work in process **B** Beginning inventory of finished materials goods A Add: Raw materials used plus direct A Add: Purchases of raw materials A Add: Inventory transferred from work in process Raw materials available for use Work in process inventory available to be finished Finished goods inventory available S Subtract: Raw materials used / for sale S Subtract: Inventory transferred to E Ending inventory of raw finished goods S Subtract: Cost of goods sold materials **E** Ending inventory of work in process **E** Ending inventory of finished goods

Goal: keeps track of physical flow of units & costs



B. Equivalent Units

Costs must be attached to the completed units as well as to the units that are partially complete at the end of each period. This calculation is made by taking into account the partially completed units and by making use of equivalent units.

PASS KEY

Accounting for the physical flow of units is an important step in process costing. Remember, however, that the pure physical flow of units will be different from the equivalent units of production.

1. Equivalent Unit Defined

An equivalent unit of direct material, direct labor, or conversion costs (direct labor plus factory overhead) is equal to the amount of direct material, direct labor, or conversion costs necessary to complete one unit of production.

EXAMPLE

Company X would like to produce 10,000 units during the first quarter. The company obtains the raw material inputs prior to the production of each unit and has applied the necessary direct labor and manufacturing overhead to complete 75% of the production during the first two months (with the remaining production process to be performed during the third month).

When preparing its internal monthly production reports, Company X would indicate that it has 10,000 units 100% complete as to direct materials and 7,500 equivalent units of production as to direct labor and overhead at the February 28 month end.

2. Process Costing Assumptions

a. Transfers In Are 100 Percent Complete

Transfers in from other departments are always considered 100 percent complete. The transfer in costs of direct material from a previous department are treated as direct materials (DM), even though they are called "transfer in" costs or "previous department" costs.

b. Timing of Addition of Direct Material

(1) Addition at the Beginning or During a Process

Direct material added at the beginning of or during a second or later process may either be 100 percent complete or "partially complete," depending on how much work has been done on that component of the process.

(2) Addition at the End of a Process

Any material added at the (very) end of a process will not be in work in process inventory at the month end.

C. Costing Issues

1. Calculations of Average Unit Costs

The calculation of average unit costs and the application of those costs to various segments of the process is complicated by a number of issues.

a. Averaging of Costs From Prior Month's WIP

Frequently, costs from the previous month's work in process inventory are different from costs of the current month. These costs must be averaged.

按 b. Cost Flow Assumptions

Cost averaging computations depend upon FIFO and/or weighted (or moving) average cost flow assumptions. These computations require a well-labeled account analysis format for each unit of direct material, direct labor, or overhead.

D. Specific Cost Flow Assumptions

1. Calculation Using First-In First-Out FIFO

Under FIFO accounting, the ending inventory is priced at the cost of manufacturing during the period, assuming that the beginning inventory was completed during the period.

a. Equivalent Unit Components

The equivalent units are composed of three elements

- (1) Completion of units on hand at the beginning of the period
- (2) Units started and completed during the period (Units completed Beginning WIP)
- (3) Units partially complete at the end of the period

b. Cost Components

Current costs incurred during the period are allocated to the equivalent units produced during the period.

2. Calculation Using Weighted Average

The weighted average cost method averages the cost of production during the period with the costs in the beginning work in process inventory.

a. Equivalent Unit Components

The equivalent units are composed of two elements:

- (1) Units completed during the month (beginning WIP + units started and completed during the month)
- (2) Units partially complete at the end of the period

b. Cost Components

Total costs, including both the costs of beginning inventory and current costs, are allocated to equivalent units to arrive at a weighted average unit cost.



EXAMPLE—EQUIVALENT UNITS OF	PRODUCTION		
Assume the following information:			
Work in process, beginning	100 units, 25% c	omplete	
Units completed and transferred out	6	00 units	
Work in process, ending	200 units, 40% c	omplete	
Weighted-Average Equivalent Units of Production			
Units completed and transferred out (always 100%)		600	
2) Work in process, ending			
200 units × 40%		_80	
Equivalent units of production		680 E	u 'W
FIFO Equivalent Units of Production			
Work in process, beginning			
100 units × 75% (to complete)		75	
2) Units started and completed this period			
Units completed and transferred out	600		
Units in beginning inventory	(100)	500	
3) Work in process, ending			
200 units × 40%		_80	
Equivalent units of production		655 E	U FI

3. Comparison of FIFO and Weighted Average

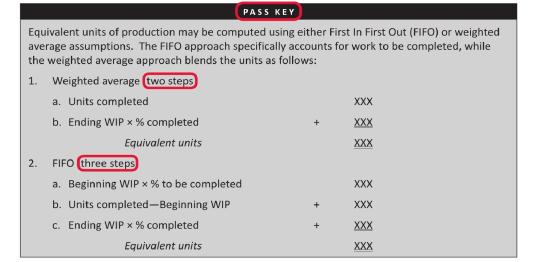
a. Unit Components

Equivalent unit calculation under FIFO consists of three elements representing current period production, whereas the calculation under the weighted average method consists of only two elements, units completed and units available in beginning inventory.

b. Cost Components

FIFO represents only costs incurred in the current period. The weighted average approach includes both current period units plus prior period units.

FC





PASS KEY

Cost per equivalent unit is computed by dividing total costs by equivalent units. FIFO anticipates using only current costs, while the weighted average approach uses both beginning inventory and current costs as follows:

Weighted average Weighted Beg

```
average Equivalent units 680

2. FIFO

FIFO = Current cost only Equivalent units 655 From step
```

Beginning cost + Current cost

On own

EXAMPLE

Comprehensive Example

Process Costing Under FIFO and Weighted Average

May Year 1

FACT PATTERN

		Percent			
		Complete	Materials	Conversion	Total
1 Units in process, May	1				
Materials		100%	4,000		
Conversion		40%		4,000	
2 Units started and com	pleted in May				
Materials		100%	10,000		
Conversion		100%		10,000	
3 Units in process, May	31				
Materials		100%	2,000		
Conversion		80%		2,000	
4 Costs associated with	May 1 WIP				
Materials			\$ 1,000		\$ 1,000
Conversion				\$ 3,000	3,000
5 Costs associated with	May production				
Materials			\$24,000		24,000
Conversion				\$49,000	49,000
6 Total Costs					<u>\$77,000</u>

Requirements

Compute Equivalent Units of Production Using FIFO and Weighted Average Compute Unit Cost of Production Using FIFO and Weighted Average Compute Equivalent Cost per Unit Using FIFO and Weighted Average

EXAMPLE (CONTINUED)				
COMPUTE EQUIVALENT UNITS OF PRODUCTION				
	First In I	First Out	Weighted	l-Average
	Materials (%)	Conversion (%)	Materials (%)	Conversion (%)
1 Units in process, May 1		<u>2,400</u> (60%)	<u>4,000</u> (100%)	4,000 (100%)
2 Units started and completed in May	10,000 (100%)	10,000 (100%)	10,000 (100%)	10,000 (100%)
3 Units in process, May 31	<u>2,000</u> (100%)	<u>1,600</u> (80%)	2,000 (100%)	1,600 (80%)
Total Units	12,000	14,000	16,000	<u>15,600</u>
Alternative FIFO Computation				
Weighted Average Equivalent Unit	16,000	15,600		
Equivalent Units from prior periods included				
in beginning inventory	(4,000)	(1,600)		
Equivalent units	12,000	<u>14,000</u>		
COMPUTE UNIT COST OF PRODUCTION				
4 Costs in WIP, May 1	\$ -	\$ -	\$ 1,000	\$ 3,000
5 Costs during May	24,000	49,000	_24,000	49,000
Total Costs	<u>\$24,000</u>	\$49,000	<u>\$25,000</u>	<u>\$52,000</u>
COMPUTE EQUIVALENT COST PER UNIT				
Equivalent cost per unit	\$ 2.00	<u>\$ 3.50</u>	<u>\$ 1.56</u>	\$ 3.33

E. Spoilage (or shrinkage)

Spoilage (or shrinkage) is generally taken care of automatically because the equivalent units added for the month are generally less than the actual units added during the month due to problems with the production process.

▶1. Normal Spoilage (inventory cost) B/S

Normal spoilage occurs under regular operating conditions and is included in the standard cost of the manufactured product.

a. Computation

For normal spoilage (or shrinkage), per unit cost is automatically increased as a result of spoilage because actual costs are spread over fewer equivalent good units rather than actual units produced.

b. Accounting Treatment

Normal spoilage is capitalized as part of inventory cost. Normal spoilage costs, if accounted for separately, are allocated to good units produced.

▶2. (Abnormal)Spoilage (period expense)

Abnormal spoilage should not occur under normal operating conditions and is not included in the standard cost of a manufactured product.

a. Computation

For abnormal spoilage (or shrinkage), the per unit cost is based on actual units. Equivalent units of production include spoiled units.

b. Accounting Treatment

The cost of abnormal spoilage is normally expensed separately on the income statement as a period expense.

EXAMPLE - SPOILAGE APPLICATION

Fresh Baked Company produces ready-to-serve fruit pies for local restaurants and supermarkets. During the month of April, the company had the following costs related to the production of 20,000 pies:

Pie ingredients	\$45,000	ı
Baking labor	24,000	Product
Plant production overhead	11,000 —	
Sales and marketing expenses	500	Period
General and administrative expenses	1,200	revioa
Normal spoilage	400	Product
Abnormal spoilage	200	Period

Question 1:

What is the per unit cost of the pies assigned to inventory for April?

Question 2:

What amount will the company assign as a period expense for April?

Solution 1:

Step 1: Determine inventory costs.

Pie ingredients	\$45,000
Baking labor	24,000
Plant production overhead	11,000
Normal spoilage	400
Total inventory costs	<u>\$80,400</u>

Step 2: Determine per unit cost.

Per unit cost (of pies) = $$80,400 \div 20,000$ pies

= \$4.02

Solution 2:

The period expenses assigned to April are as follows:

Sales and marketing expenses	\$ 500
General and administrative expenses	1,200
Abnormal spoilage	200
Total period expenses	\$ 1,900

VIII. ACTIVITY-BASED COSTING (ABC)

A. Types of Operational Cost Drivers

Volume-Based

Traditional costing systems assign overhead as a single cost pool with a single plantwide overhead application rate using a single allocation base. These rates generally use volume-based cost drivers such as direct labor hours or machine hours. Assigning overhead costs based on volume can distort the amount of costs assigned to various product lines since all overhead costs do not fluctuate with volume.

Activity-Based - Uses multiple O/H rates by department

Activity-based costing (ABC) refines traditional costing methods and assumes that the resource-consuming activities (tasks, units of work, etc.) with specific purposes cause costs. ABC assumes that the best way to assign indirect costs to products (cost objects) is based on the product's demand for resource-consuming activities (i.e., costs are assigned based on the consumption of resources). Application of activity-based costing techniques attempts to improve cost allocation by emphasizing long-term product analysis.

В. **Introduction to Activity-Based Costing**

Terminology

Activity

An activity is any work performed inside a firm. Activities are identified for ABC.

Resource

A resource is an element that is used to perform (or applied to perform) an activity.

Cost Drivers

ABC - multiple

Cost drivers used in ABC are activity bases that are closely correlated with the

incurrence of manufacturing overhead costs in an activity center, and they are often used as allocation bases for applying overhead costs to cost objects.

PASS KEY

A cost driver is a factor that has the ability to change total costs. Cost drivers (including nonfinancial, statistical measurements of activities such as sales or production volume) are identified by ABC and are related to one of multiple cost pools for cost allocation.

d. **Resource Cost Driver**

A resource cost driver is the amount of resources that will be used by an activity.

e. **Activity Cost Driver**

An activity cost driver is the amount of activity that a cost object will use, and it is used to assign the costs to the cost objects.

Activity Centers "Cost pools" Traditional - one for factory

ABC - multiple - by department

An operation necessary to produce a product is an activity center.

EXAMPLE

Hope Hospital applies ABC to costing its services. The surgical unit is identified as an activity center that includes various professional service (surgeon and nurse) functions as well as facilities (operating room) functions. Resources used include hours of staff time for surgery and for operating room preparation as well as facilities maintenance. Resource drivers may include the complexity of surgical procedures (including setup time) and activity drivers may be purely admissions or scheduled surgeries.

g. Cost Pool

A *cost pool* is a group of costs (e.g., raw material or direct labor) or a specially identified cost center (e.g., a department or a manager) in which costs are grouped, assigned, or collected.

2. Characteristics of ABC

ABC applies a more focused and detailed approach than using a department or plant as the level for gathering costs. ABC focuses on multiple causes (activities) and effects (costs) and then assigns costs to them. The cost of activities is used to "build up" the engineered cost of products using increased cost pools and allocations.

- a. ABC can be part of a job order system or a process cost system.
- b. ABC can be used for manufacturing or service businesses.
- ABC takes a long-term viewpoint and treats production costs as variable.
- d. The cost driver is often a nonfinancial variable.
- e. ABC may be used for internal but not for external purposes.

3. Transaction-Based Costing

Activity-based costing (ABC) is also referred to as *transaction-based costing*. The cost driver is typically the number of transactions involved in a particular activity.

4. Focuses on Cost/Benefit of Activities

ABC focuses management on the cost/benefit of activities. Value-added activities increase the product value or service.

a. Value Chain (value-added activities) - DM, DL

A *value chain* is a series of activities in which customer usefulness is added to the product. Support activities directly support value-added activities.

b. Non-Value-Added Activities - Surplus inventory

Non-value-added activities do not increase product value or service and are targeted for elimination. Often, these types of activities (e.g., warehousing) should be eliminated.

C. Basic Operation of Activity-Based Costing

1. Analysis of Cost Drivers

Identify the activity centers and the activities that drive the costs in each activity center.

2. Accumulate the Costs in Cost Pools

Many small cost pools are accumulated.

3. Trace Indirect Costs to Activity Centers

Trace any indirect costs to the activity centers that can be assigned without allocation.

4. Allocate Remaining Indirect Cost Pools

Costs of each activity are applied to cost objects based on the most appropriate cost drivers.

5. Divide Assigned Costs by Level of Activity for the Cost Center

Divide the costs assigned to the activity center by the estimated level of activity for the center to derive an application rate for that center.

6. Cost the Product

Cost the product by multiplying its demand for the resources of an activity center by the rate for that activity center.

D. Effects of Activity-Based Costing Advantages

An ABC system will apply high amounts of overhead to a product that places high demands on expensive resources. If a product places few demands on expensive resources, the system will assign little of that cost to the product. This will remove much of the cost distortion caused by traditional, volume-based overhead systems.

E. ABC and Standard Cost Systems

Standard cost systems are a natural extension of activity-based costing. Standards are set at activity levels based on cost drivers. Useful variances are calculated by comparing actual and standard costs that consider levels of activity. These variances can be due to price (rate for labor), usage (efficiency), or other factors. Further, flexible budgets are derived at the activity level.

- 1. Normal and abnormal scrap or spoilage is estimated for activity levels.
- 2. Standards may be difficult to set on a per unit basis.
 - a. Per unit costs are often inversely proportional to volume.
 - b. Assumption of a relevant range may be necessary to set a per unit standard.

Total hours Can 150

EXAMPLE

lowa Products makes two products in their Boone factory. They have used a traditional cost accounting system for the application of overhead to the products. Currently they use direct labor hours as an application base. The product Can incurred 150,000 direct labor hours, and Bottle incurred 45,000 direct labor hours. They are considering converting to an activity-based costing system. The estimated data for their Year 1 operations is summarized below:

			ACTIVIT	<u>y Levei</u>
Activity Center	<u>Costs</u>	<u>Cost Driver</u>	<u>Cans</u>	Bottles
Units			500,000	150,000
Material handling	\$ 480,000	Pounds	100,000	60,000
Production orders	\$ 90,000	Number of production orders	100	100
Product redesign	\$ 250,000	Number of changes	50	200
Plant utilities	\$2,300,000	Machine hours	150,000	80,000
Takal O/U	3 120 000			

Total O/H 3,120,000

1. Illustration of the overhead application rate under a traditional system using direct labor hours as an application hase:

 Material handling
 \$ 480,000

 Production orders
 90,000

 Product redesign
 250,000

 Plant utilities
 2,300,000

 Total overhead costs
 \$3,120,000

Overhead application rate = $\frac{\text{Total overhead costs}}{\text{Total direct labor hours}} = \frac{3,120,000}{195,000 \text{ hvs.}} = $160/\text{H per DLH}$

\$4.80 per bottle

= \$3,120,000 / (150,000 + 45,000) = \$16 per direct labor hour

\$720,000 / 150,000 bottles

 Cans:
 150,000 direct labor hours × \$16
 = \$2,400,000

 \$2,400,000 / 500,000 cans
 = \$4.80 per can

 Bottles:
 45,000 direct labor hours × \$16
 = \$720,000

O/H allocated based solely on volume

 Illustration of the overhead application rate under an activity-based costing system using each activity as a cost pool:

 Material handling:
 \$480,000 / 160,000 pounds
 = \$3 per pound

 Production orders:
 \$90,000 / 200 orders
 = \$450 per order

 Product redesign:
 \$250,000 / 250 changes
 = \$1,000 per change

 Plant utilities:
 \$2,300,000 / 230,000 machine hrs.
 = \$10 per machine hour

Multiple O/H rates

Assign O/H to products by dept.

Cans: Material handling, 100,000 lbs. × \$3 \$ 300,000 Production orders, 100 orders × \$450 45,000 Product redesign, 50 changes × \$1,000 50,000 Plant utilities, 150,000 machine hrs. × \$10 ,500,000 < 2,400,000 Total overhead costs \$1,895,000 \$1,895,000 / 500,000 cans = \$3.79 per can Bottles: Material handling, 60,000 lbs. × \$3 \$ 180,000 Production orders, 100 orders × \$450 45,000 Product redesign, 200 changes × \$1,000 200,000 Plant utilities, 80,000 machine hrs. × \$10 800,000

More accurate assignment of O/H costs to individual products

\$1,225,000 / 150,000 bottles = \$8.167 per bottle

Total overhead costs

Bottle cost significantly increased with activity-based costing. This resulted because bottles required a large amount of the redesign resource. Redesign is a very costly resource and not related to volume. Since bottles required a large amount of this resource, a high amount of indirect cost was assigned to bottles. The cost of cans decreased significantly since it used comparatively little redesign resource.

\$1,225,000

> 720,000

F. Service Costs Allocation Using ABC

1. Overview

Companies in all sectors of the economy allocate service department costs to production or user departments and ultimately the final products produced.

EXAMPLE

Hospitals use complex methods to allocate service-related costs such as patient admissions or housekeeping to the various hospital departments which ultimately impact patient billing. By allocating these service department costs to the individual production departments and the final product, the entity is recognizing that these service costs are an input into the production process.

2. Direct Method

- The direct method is the most widely used (and least complex) method to allocate service costs.
- b. Each service department's total costs are directly allocated to the production departments without recognizing that service departments themselves may use the services from other service departments.

3. Step-Down Method

- a. The *step-down method* or sequential method is a <u>more sophisticated approach to allocate service</u> costs in more complex situations.
- b. Service department costs are also allocated to other service departments as well as production departments.
- c. Step-down allocations assume that once a service department's costs have been allocated to another service department, there can be no subsequent costs allocated back to the other service department(s).

EXAMPLE-DIRECT METHOD

On own

Remington Company has two production departments, Division A and Division B. The company also has two service departments, which consist of Information Systems (IS) and Human Resources (HR). During the most recently completed operating year, the IS and HR departments had total service costs of \$2,220,000 and \$975,000, respectively. The allocation of these costs to the two production divisions using ABC is as follows:

Dept.	Activity Center	Cost Driver	Division A	Division B
IS	Planning and Reporting	Computing Hours	9,000	6,000
HR	Division Administration	Performance Appraisals	2,800	2,200

Application Rate using ABC system:

Planning and Reporting $$2,220,000 \div 15,000 \text{ hours} = $148/\text{hr.}$ Division Administration $$975,000 \div 5,000 \text{ appraisals} = $195/\text{appraisal}$

Division A—Service Cost Allocation:

IS—Planning and Reporting: 9,000 hours x \$148 =\$1,332,000HR—Division Administration: 2,800 appraisals x \$195 =546,000Total Service Costs\$1,878,000

Division B—Service Cost Allocation:

IS—Planning and Reporting: 6,000 hours x \$148 = \$888,000 HR—Division Administration: 2,200 appraisals x \$195 = 429,000 **Total Service Costs** \$1,317,000

On own

EXAMPLE-STEP-DOWN METHOD

Assume the same facts as the Remington Company direct method example above, with the exception that the Information Systems (IS) department also uses the services of the Human Resources (HR) department. Specifically, performance appraisals administered by the HR department to the IS department accounted for an additional 200 appraisals during the recent operating year. Further assume that because of data privacy issues, the HR department uses an outside contractor for its information technology needs instead of the IS department. The allocation of the service costs for performance appraisals from HR to IT and the two production divisions using ABC is as follows. (*Note: The allocation of IT computing service hours to the other two production divisions remains the same as above, as there is no IT service allocation to HR*.)

Dept.	Activity Center	Cost Driver	IT Dept.	Division A	Division B
HR	Division Administration	Performance Appraisals	200	2,800	2,200

HR Application Rate using ABC System:

HR—Division Administration \$975,000 ÷ 5,200 appraisals = \$187.50/appraisal

IT Service Department—Service Cost Allocation (of HR):

HR—Division Administration 200 appraisals x \$187.50 = \$37,500

IT Application Rate using ABC System:

IT—Planning and Reporting $($2,220,000 + $37,500) \div 15,000 \text{ hours} = 150.50 per hour

Division A—Service Cost Allocation:

 IT—Planning and Reporting: 9,000 hours x \$150.50 =
 \$1,354,500

 HR—Division Administration: 2,800 appraisals x \$187.50 =
 525,000

 Total Service Costs
 \$1,879,500

Division B—Service Cost Allocation:

 IT—Planning and Reporting: 6,000 hours x \$150.50 =
 \$903,000

 HR—Division Administration: 2,200 appraisals x \$187.50 =
 412,500

 Total Service Costs
 \$1,315,500

It should be noted that under the step-down method, the HR (performance appraisal) allocation is lower to both Division A and Division B under ABC costing, given that HR costs are also allocated to the IS department.

IX. JOINT PRODUCT COSTING AND BY-PRODUCT COSTING (common cost allocation)

Accountants face the problem of allocating the cost of a single process (joint costs) among several final products (or by-products) if two or more final products are produced from the same raw material or input. The process of joint costing is illustrated below:

EXAMPLE

The meat packing industry takes a single input, a steer, and produces many different final products. Each product must be assigned a cost, including the different cuts of meat for human consumption, different food products for animal consumption (pet food), and basic ingredients for glue (by-product).

A. Introduction

Common (or joint) costs relate to more than one product and cannot be separately identified. Common costs must be allocated in some manner to the benefiting cost object.

B. Summary of Terms

1. Joint Products "Main products"

Joint products are two or more products that are generated from a common input.

2. By-products

By-products are minor products of <u>relatively small value</u> that <u>incidentally</u> result from the manufacture of the main product.

3. Split-off Point

The *split-off point* is that <u>point</u> in the <u>production process</u> where the joint products can be recognized as individual products.

4. **Joint Product Costs** (or joint costs)

Joint product costs are costs incurred in producing products up to the split-off point.

5. Separable Costs

Separable costs are costs incurred on a product after the split-off point.

PASS KEY

A cost driver is a factor that has the ability to change total costs. Cost drivers (including nonfinancial, statistical measurements of activities such as sales or production volume) are identified by ABC and are related to one of multiple cost pools for cost allocation.

C. Joint Products

Joint products represent outputs of significant value that are the object of a manufacturing process. Cost drivers in the manufacturing process cannot be distinguished for each product, so common costs must be allocated by some arbitrary means.

method #1

Allocation by Unit Volume Relationships

EXAMPLE

Facts:

Simple Manufacturing Company produces two products including Product A and Product B. Direct costs associated with manufacturing Product A and Product B were \$25,000 and \$50,000, respectively, with joint costs of production representing \$10,000 In order to allocate joint costs, the company used the proportional gallons of production for its two products as follows:

	<u>Volume</u>	
Product A	10,000 gal	1/3
Product B	20,000 gal	2/3
Total	30,000 gal	

Question: What portion of joint costs will each be allocated and what is the total cost of each product?

Joint Cost Allocation:

Product A:	10,000 / 30,000 (\$10,000)	=	\$3,333
Product B:	20,000 / 30,000 (\$10,000)	=	6,667
			\$10,000
Total Cost:			

Product A: \$25,000 (direct) + \$3,333 (joint) = \$28,333 Product B: \$50,000 (direct) + \$6,667 (joint) = \$56,667

2. Relative Net Realizable Values at Split-off Point

Net realizable value equals sales value less cost of completion and disposal. Relative sales value at split-off point is used purely for inventory costing and is of little use for cost planning and control purposes.

Method #2

a. Sales Price Quotations Available at Split-off

The relative sales value at split-off point can be used to allocate joint costs if sales price quotations are known or can be determined. The relative sales value approach assigns costs to the separate joint products in relation to their market values.

EXAMPLE					
Joint costs		\$1,000			
Joint product produced:					
Product A—100 units	, sales value at split-off	\$20			
Product B—400 units	, sales value at split-off	\$15			
Allocation based on relative sales value:					
Product A—100 units @ \$	20	\$2,000	2/8 = 25%		
Product B—400 units @ \$3	15	6,000	6/8 = 75%		
		<u>\$8,000</u>			
Joint cost allocated to A:	\$1,000 × (\$2,000 ÷ \$8,0	00) =	\$ 250		
Joint cost allocated to B:	\$1,000 × (\$6,000 ÷ \$8,0	00) =	<u>750</u>		
Total allocated joint cost			<u>\$1,000</u>		

Method #3

b. Sales Values Not Available at Split-off

If sales values at split-off are not explicitly available because there are no markets for the joint products at split-off; computation of sales values at split-off are derived on the ultimate sales value at point of sale.

(1) Work Backward

Working backward estimates net realizable values at the split-off point.

(2) Separable Costs

Identifiable costs incurred after the split-off point (separable costs) must be subtracted from the final selling price to arrive at the net realizable value at split-off.

EX	EXAMPLE				
Smith Company produces two joint products: F and G. Joint production costs for October were \$30,000 During October, further processing costs beyond the split-off point (separable costs), needed to convert the products into saleable form, were \$16,000 and \$24,000 for 1,600 units of F and 800 units of G, respectively. F sells for \$25 per unit, and G sells for \$50 per unit. Smith uses the net realizable value method for allocating joint product costs. What were the joint costs allocated to F during October?					
Product F—Net realizable value					
Sales value, \$25 per unit × 1,600 units	\$40,000				
Further processing costs	(16,000)				
Net realizable value		\$24,000	24/40 = 60%		
Product G—Net realizable value					
Sales value, \$50 per unit × 800 units	\$40,000				
Further processing costs	(24,000)				
Net realizable value		16,000	16/40 = 40%		
Total net realizable value		\$40,000			
Joint costs allocated to F					
\$30,000 × (\$24,000 / \$40,000)	\$18,000				
Joint costs allocated to G					
\$30,000 × (\$16,000 / \$40,000)	\$12,000				

3. Service Departments Cost Allocation to Joint Products

The allocation of service department costs to joint products can be accomplished by using the joint products unit-volume relationship (per above).

\$30,000

On own

Total joint costs

Returning to the Simple Manufacturing Company example above, recall the company manufactures two products (Product A and Product B) and allocates its joint costs using the proportional gallons of production for its two products as follows:

EXAMPLE

	<u>Volume</u>
Product A	10,000 gal
Product B	<u>20,000 gal</u>
Total	30,000 gal

Further assume that the company's lone service department is Janitorial Services and that costs incurred for this department were \$6,000 for the operating year.

Question: What portion of **service department costs** will be allocated to each product based on the joint products unit-volume relationships indicated above?

Solution:

Product A:	10,000 / 30,000 (\$6,000)	=	\$2,000
Product B:	20,000 / 30,000 (\$6,000)	=	4,000
			\$6,000

D. By-products

By-products represent outputs of <u>relatively minor value that are</u> incidental to a manufacturing process. By-products have relatively low sale values that are not sufficient to cover their share of common costs (otherwise, they would be joint products). Revenue accounting can take one of two forms:

1. Applied to Main Product

Any proceeds from the sale of by-products are a <u>reduction to common costs</u> for joint product costing. The revenue earned from their sale is credited to joint costs incurred either at the time of production or the time of sale.

O٢

2. Miscellaneous Income

As an alternative, revenue from the sale of by-products may be <u>credited to miscellaneous income</u>.

E. Decisions Regarding Method to Use (by-product or joint)

Decisions regarding whether to use by-product costing or joint costing are practical ones, and they depend on relative sales demand.

EXAMPLE

Before the invention of the automobile, the gasoline produced when the oil was refined had no value and was scrap for disposal. After the invention of the automobile, gasoline was first priced as a by-product and then priced as a joint product (when the demand for gasoline increased).

Business 2

Strategic Planning: Techniques for Forecasting, Budgeting, and Analysis

1.	Profitability and pricing analysis	3
2.	Marginal analysis	16
3.	Forecasting and projection	24
4.	Budgeting	31
5	Variance analysis	10
٦.	variance analysis	43
6.	Responsibility accounting	59
7.	Class questions	63

NOTES

PROFITABILITY AND PRICING ANALYSIS

I. COST-VOLUME-PROFIT (CVP) ANALYSIS FOR DECISION MAKING

Cost-volume-profit (CVP) analysis is used by managers to forecast profits at different levels of sales and production volume. The point at which revenues equal total costs is called the breakeven point. Cost-volume-profit analysis is synonymous with breakeven analysis. $\longrightarrow P_{VO} + t_{VO} +$

A. Assumptions

1. General Assumptions

- a. All costs can be separated into either variable or fixed costs, depending on the behavior of the cost.
- b. Volume is the only relevant factor affecting cost.
- c. All costs behave in a linear fashion in relation to production volume.
- d. Cost behaviors are anticipated to remain constant over the relevant range of production volume because there is an assumption that the efficiency of production does not change.
- e. Costs show greater variability over time. The longer the time period, the greater the percentage of variable costs. The shorter the time period, the greater the percentage of fixed costs.

2. Use of Single Product

Although cost-volume-profit analysis can be performed for more than one product, in its simplest form, the model assumes that the product mix remains constant.

3. Contribution Approach (Direct Costing) Is Used Rather Than Absorption Approach GAAP

The contribution approach to the income statement is used for breakeven analysis. Identifying each element of cost as fixed or variable defines its relationship to volume and to the computation of breakeven. Sales - Variable costs - Fixed costs = Profit

4. Selling Prices Remain Unchanged

The volume of transactions produces a uniform contribution margin per unit and a predictable projected contribution margin based on volume.

B. Absorption Approach vs. Contribution Approach

1. Absorption Approach

The absorption approach, which is required for financial reporting under U.S. GAAP, does not segregate fixed and variable costs.

a. Equation

The equation for the absorption approach follows:

Product cost

Less: Cost of goods sold = DM + DL + O/H (fixed and variable)

Gross margin

Less: Operating expenses = SG&A (fixed and variable)

Net income

Contribution Approach

The contribution approach to the income statement uses variable costing (also called direct costing). Although it does not represent generally accepted accounting principles, the contribution approach is extremely useful for internal decision making.

Equation

Revenue

Less: Variable costs DM + DL + Variable O/H + Variable SG&A Contribution margin

Less: Fixed costs Fixed O/H + Fixed SG&A

Net income

PASS KEY

Variable costs include direct labor, direct material, variable manufacturing overhead, shipping and packaging, and variable selling expenses.

Fixed costs include fixed overhead, fixed selling, and most general and administrative expenses.

Presentation

(1) Total or Per Unit

Revenue, variable costs, and contribution margin may be expressed in total and on a per-unit basis.

Unit Contribution Margin = Sales/unit - VC/unit

Unit contribution margin is the unit sales price minus the unit variable cost.

Contribution Margin Ratio

The contribution margin ratio is the contribution margin expressed as a percentage of revenue.

PASS KEY

The contribution ratio formula is expressed as follows:

Contribution margin ratio = Contribution margin ÷ Revenue

Absorption Approach vs. Contribution Approach

difference only The difference between the absorption approach and the contribution approach is the treatment of fixed factory overhead. Selling, general, and administrative expenses are period costs under both methods.

Treatment of Fixed Factory Overhead

tment of Fixed Factory Overhead Fixed & variable Absorption Approach— $\frac{Product\ Cost}{COGS} = DM + DL + \frac{O/H}{O}$

Under the absorption approach (absorption costing), all fixed factory overhead is treated as a product cost and is included in inventory values. Cost of goods sold includes both fixed costs and variable costs.

(2) Contribution Approach—Period Cost

Under the contribution approach (variable costing), all fixed factory overhead is treated as a period cost and is expensed in the period incurred. Inventory values include only the variable manufacturing costs, so cost of goods sold includes only variable manufacturing costs.

NOT GAAP

b. Treatment of Selling, General, and Administrative Expenses

Selling, general, and administrative expenses are period costs used in the determination of net income under both methods.

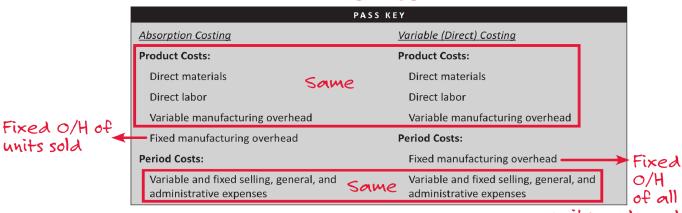
(1) Absorption Approach

Under the *absorption approach*, both variable and fixed selling, general, and administrative expenses are part of operating expenses and are reported on the income statement separately from cost of goods sold.

(2) Contribution Approach

Under the contribution approach, the variable selling, general, and administrative expenses are part of the total variable costs for the contribution margin calculation.

Memorize!



c. Gross Margin (absorption) vs. Contribution Margin

units produced (even if not sold)

The general income statement formats of both methods are presented below:

Absorption (Full Cost) Method		Contribution Margin Variable (Direct) Cost Method	
Sales	\$XX	Sales	\$XX
Less: Cost of goods sold	_(X)	Less: Variable cost of goods sold (excludes fixed overhead)	(X)
Gross margin*	XX	Less: Variable selling and administrative expense	(X)
Less: Variable selling and administrative expenses	(X)	Contribution margin	\$XX
Fixed selling and administrative expenses	<u>(X</u>)	Less: <mark>Fixed</mark> expenses	
Operating income	<u>\$XX</u>	Fixed manufacturing overhead	(X)
*Gross profit margin may also be stated as a percentage, which is calculated as gross margin (or profit) divided by net sales.		Fixed selling and administrative expenses Operating income	<u>(X)</u> <u>\$XX</u>

Effect on Income Production = Sales - no difference

(If all production is sold every period, both methods produce the same operating income figures. However, if the number of units sold is more or less than the number of units produced, the operating income figures will be different.

Production Greater Than Sales = Inventory increase

If units produced exceed units sold, then some units are added to ending inventory and income is higher under absorption costing than under variable costing.

- Under absorption costing, a portion of the fixed manufacturing overhead is included with each unit in ending inventory. (On B/S, not I/S)
- Under variable (direct) costing, all fixed manufacturing overhead is considered a period cost and is expensed during the period.

Sales Greater Than Production = Inventory decrease b.

If units sold exceed units produced, then ending inventory is less than beginning inventory and income is lower under absorption costing than under variable costing.

- Under absorption costing, the fixed manufacturing overhead carried over from a previous period as a part of beginning inventory is charged to cost of sales.
- Move cost from B/S to I/S Under variable (direct) costing, those fixed costs were charged to income in a (2) prior period (when they were incurred).

Facts: Total fixed O/H = \$200,000

Units

produced = 1,000 Units sold = 800

PASS KEY

Examiners frequently ask about the difference between variable costing net income and absorption

costing net income. Follow the simple steps below to compute the difference: \$200,000/1,000 = \$200/uvitStep 1: Compute fixed cost per unit (Fixed manufacturing overhead / Units produced)

Step 2: Compute the change in income (Change in inventory units × Fixed cost per unit)

Determine the impact of the change in income: $(1,000 - 800) \times \$200 = \$40,000$ Step 3:

Absorption net income = Variable net income No change in inventory: Increase in inventory: Absorption net income > Variable net income <

Decrease in inventory: Absorption net income < Variable net income

5. **Benefits and Limitations of Each Method**

Absorption (GAAP) Costing

(1) Absorption Costing—Benefits

- Absorption costing is GAAP.
- The Internal Revenue Service requires the use of the absorption method (b) for financial reporting.

Absorption Costing—Limitations

- The level of inventory affects net income because fixed costs are a component of product cost.
- The net income reported under the absorption method is less reliable (especially for use in performance evaluations) than under the variable method because the cost of the product includes fixed costs and, therefore, the level of inventory affects net income.

b. Variable (Direct) Costing

(1) Variable Costing—Benefits

- (a) Variable and fixed costs are separated and can be easily traced to and controlled by management.
- (b) The net income reported under the contribution income statement is more reliable (especially for use in performance evaluations) than under the absorption method because the cost of the product does not include fixed costs and, therefore, the level of inventory does not affect net income.
- (c) Variable costing isolates the contribution margins in financial statements to aid in decision making (the contribution margin is defined as sales price less all variable costs, including variable sales and administrative costs, and breakeven analysis is often based on contribution margins).

(2) Variable Costing—Limitations

- (a) Variable costing is not GAAP.
- (b) The Internal Revenue Service does not allow the use of the variable cost method for financial reporting.

6. Concept Example—Absorption vs. Variable Costing

EXAMPLE				
What is the cost of the inventory located in the finished goods warehouse under absorption and variable costing?				
a. Absorption costing \$9.0	0			
b. Variable costing \$6.5	<u>o</u>			
Costs	Total Costs	Absorption Method Product Cost	Contribution Method Product Cost	
Direct materials	\$1.00	\$1.00	\$1.00	
Labor:				
Direct	4.00	4.00	4.00	
Indirect (fixed building maintenance)	0.50	0.50	- Excludea	
Overhead:				
Variable	1.50	1.50	1.50	
Fixed	2.00	2.00	- Excluded	
Commissions to salesman	1.00	_	_	
Freight out	0.80	<u> </u>	<u> </u>	
Total	<u>\$10.80</u>	<u>\$9.00</u>	<u>\$6.50</u>	

Contribution margin Breakeven Computation Sales - VC - FC = Profit

Breakeven analysis determines the sales required (in dollars or units) to achieve zero profit or loss from operations. In determining the amount in revenues required to break even, management must estimate both fixed costs overall and variable costs on a per-unit basis.

EXAMPLE

The following information is applicable to Green Grass Industries and will be used for all of the examples in the next several sections:

- Sales price per unit of \$125 and variable costs per unit of \$50. The contribution margin per unit is \$75 (\$125 - \$50) and the contribution margin ratio is 60% (\$75 / \$125).
- Fixed costs of \$150,000.
- Desired pretax profit of \$60,000, a tax rate of 40%, and desired after-tax profit of \$36,000. $\begin{array}{c} $60,000 \times (1-40\%) = $36,000 \\ \hline \end{array}$ Potential unit sales of 2,500 at the current sales price, and a maximum of 3,000 in unit sales to reach market saturation.

Breakeven Point in Units

The contribution approach to the income statement makes it easy to calculate the breakeven point in either units or sales dollars.

The breakeven point in units can be determined by dividing the unit contribution margin into the total fixed costs:

Total fixed costs =Breakeven point in units Contribution margin per unit

EXAMPLE

Calculate Green Grass' breakeven point in units:

Breakeven point in units = \$150,000 / \$75 = 2,000 units.

The company will need to sell 2,000 units in order to recover its variable costs of \$75 per unit and its total fixed costs of \$150,000.

Breakeven Point in Dollars

There are two approaches to computing breakeven in sales dollars.

Contribution Margin per Unit

Compute the breakeven point in units, and then multiply those breakeven units by the selling price per unit:

Unit price × Breakeven point (in units) = Breakeven point (in dollars)

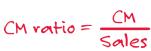
EXAMPLE

Calculate Green Grass' breakeven point in dollars, using breakeven units:

Breakeven point in dollars = $$125 \times 2,000 \text{ units} = $250,000.$

The company will need sales of \$250,000 in order to cover total variable costs of \$100,000 (2,000 units x \$50 per unit) and total fixed costs of \$150,000.

b. Contribution Margin Ratio



Divide total fixed costs by the contribution margin ratio (i.e., the contribution margin as a percentage of revenue per unit or unit price):

Total fixed costs
Contribution margin ratio

Breakeven point in dollars

EXAMPLE

Calculate Green Grass' breakeven point in dollars, using the contribution margin ratio:

Breakeven point in dollars = \$150,000 / 60% = \$250,000.

D. CVP Analysis—Profit Performance

1. Required Sales Volume for Target Profit

Breakeven analysis can be extended to calculate the unit sales or sales dollars required to produce a targeted profit. Although profit figures are most relevant on an after-tax basis, the amount that must be added to the breakeven computation in order to calculate the required sales dollars/units must be a before-tax profit amount. This is done for the purposes of maintaining consistency with the pretax sales and pretax cost figures used in the calculation.

Once again, the information pertaining to Green Grass Industries will be used for all of the examples in the next several sections.

a. Sales Units Needed to Obtain a Desired Profit

The formula is modified to treat the desired net income before taxes as another fixed cost.

Sales <mark>(units)</mark> = (Fixed cost + Pretax profit) / Contribution margin per <mark>unit</mark>

EXAMPLE

Calculate Green Grass' unit sales needed in order to achieve its desired pretax profit of \$60,000.

Sales (units) = (\$150,000 + \$60,000) / \$75 = 2,800 units.

Green Grass must sell 2,800 units in order to cover its fixed and variable costs and to achieve its desired pretax profit of \$60,000.

b. Sales Dollars Needed to Obtain a Desired Profit

There are two approaches to computing the sales dollars needed to achieve a desired profit.

(1) Summation of Total Costs and Profits

Sales dollars = Variable costs + Fixed costs + Pretax profit

EXAMPLE

Calculate Green Grass' sales (in dollars) needed in order to achieve its desired pretax profit.

Total variable costs = 2,800 units x \$50 per unit = \$140,000

Sales (dollars) = \$140,000 + \$150,000 + \$60,000 = \$350,000.

Green Grass must have sales of \$350,000 in order to cover its variable and fixed costs and achieve its desired \$60,000 pretax profit.

(2) Contribution Margin Ratio

Sales = $\frac{\text{Fixed cost + Pretax profit}}{\text{Contribution margin }} \frac{\text{ratio}}{\text{ratio}}$

EXAMPLE

Calculate Green Grass' sales (in dollars) needed in order to achieve its desired pretax profit. Sales (dollars) = (\$150,000 + \$60,000) / 60% = \$350,000.

E. Predicting Performance Based on Volume

1. Predicting Profits Based on Volume

After breakeven has been achieved, each additional unit sold will increase net income by the amount of the contribution margin per unit.

EXAMPLE

Calculate Green Grass' profit if the company sells 2,500 units.

Profit = Units above the breakeven point x Contribution margin per unit = 500 x \$75 = \$37,500.

The breakeven point calculated earlier was 2,000 units. For every unit sold above 2,000, the company will book a \$75 profit. If it sells 2,500 units, that is 500 additional units above breakeven, those 500 units will provide a total profit of \$37,500.

2. Setting Selling Prices Based on Assumed Volume

This analysis may also be used to derive a per-unit selling price necessary to cover all costs and the desired pretax profit given a specific volume limit.

Sale price per unit = (Fixed costs + Variable costs + Pretax profit) / Number of units sold

EXAMPLE

Calculate Green Grass' per-unit sales price needed to produce its desired pretax profit given the market saturation level of 3,000 units.

Per-unit sales price = [\$150,000 + (3,000 units x \$50 per unit) + \$60,000] / 3,000 = \$120 per unit.

If the company can sell 3,000 units at \$120 per unit, it will cover all fixed costs, variable costs, and the desired pretax profit.

F. Margin of Safety Concepts

The margin of safety is the excess of sales over breakeven sales and is generally expressed as either dollars or a percentage.

1. Sales Dollars

The margin of safety expressed in dollars is calculated as follows:

\$350,000 - 250,000

Total sales (in dollars) – Breakeven sales (in dollars) = Margin of safety (in dollars)

2. Percent

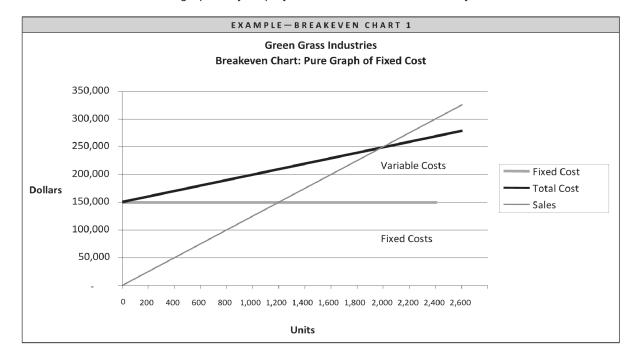
The margin of safety can also be expressed as a percentage of sales, as indicated below:

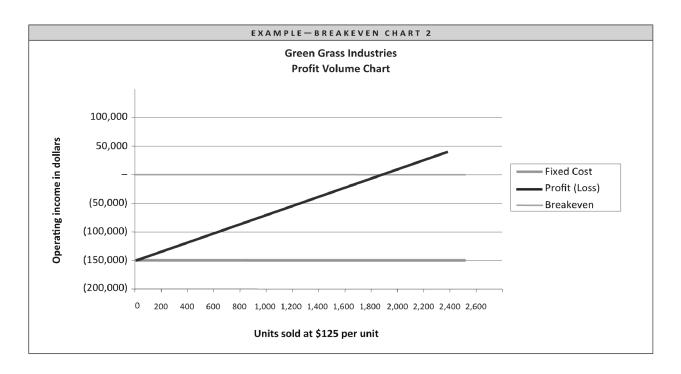
$$\frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \text{Margin of safety percentage}$$

$$\frac{\$100,000}{\$350,000} = 28.6\%$$

G. Breakeven Charts

Breakeven charts graphically display the results of breakeven analysis.





II. TARGET COSTING (used for target pricing)

Target costing is a technique used to establish the product cost allowed to ensure both profitability per unit and total sales volume.

A. Cost Determination

The concept of target costing uses the <u>selling price</u> of the product to determine the production costs to be allowed.

1. Market Circumstances Creating Target Costing

As competition (typically from a "cost leader") sets prices, any change in price could easily cause a customer defection. Target costing is the first step in establishing cost controls to ensure ongoing profitability.

2. Target Cost Computation

The target cost of the product is the market price minus profit calculated as follows:

Example:

B. Implications of Target Costing

If management commits to a target cost, serious measures must be employed to reduce costs. Although the mechanics are simple, the implications can be far-reaching.

1. Compromised Quality

The firm may have to sacrifice quality (by reducing costs), but this can have the effect of loss of sales.

2. Increased Marketing and Downstream Costs

Firms competing in this type of environment may incur increased downstream costs in an attempt to differentiate their products and create brand loyalty (and a competitive advantage).

3. Increased Complexity in Cost Measurement

Advanced cost management techniques may have to be employed to attain a higher productivity level.

4. Product Redesign

The product may have to be redesigned to provide for the reduction of costs throughout the life cycle of a product (referred to as the Kaizen Method).

III. TRANSFER PRICING (non-global perspective)

The divisions within a large company may engage in transactions with each other rather than going outside of the company. A transfer price is the price charged for the sale/purchase of a product internally (between two divisions within one overall company). The price set will determine the per-unit revenue for the selling division and the per-unit cost of the purchasing division. Given the focus of profitability for each division, the incentive for the selling division is to set a higher price, and the incentive for the purchasing division is to set a lower price. Transfer prices may be established based on the following strategies:

A. Negotiated Price

This is simply a negotiation process between the selling and purchasing divisions until an agreement is reached. The selling division will not accept a price lower than the variable cost to produce and sell the product, and the purchasing division will not accept a price higher than the market price (if available).

B. Market Price

A fair price often can be determined if an outside market exists for the product's sale/purchase. This price may even be reduced by the selling division due to cost savings from not having to market or distribute the product as it would for an outside sale.

C. Cost

When no external market for the product exists, a reasonable assessment of cost will include at least the variable costs associated with production, with fixed manufacturing overhead added as well. A reasonable profit markup also may be added to the cost to determine the sale price.

IV. TRANSFER PRICING (global perspective)

Transfer pricing is a methodology for allocating profits (or losses) among related entities within the same legal group (or corporation) in different tax jurisdictions. Transfer prices, which represent the charges for transactions between related parties, must be analyzed and documented to ensure that they are appropriate. The concern from a tax authority perspective is that a company will assign revenues and expenses on a transaction in such a way to show the lowest profit (or biggest loss) in the high tax jurisdiction and the highest profit (or smallest loss) in the lowest tax jurisdiction.

A. The Arm's Length Principle

The arm's length principle states that transfer prices must approximate the prices for comparable transactions between unrelated (independent) parties who are acting on their own free will. Typically, an arm's length range (rather than an exact price point) is established that gives the company some flexibility in the prices they charge. However, tax authorities are given the power to adjust prices if they should fall outside of that range.

B. Determining Comparability

In order to determine comparability, the following factors should be assessed:

- The nature of the goods, services, or property
- Contractual terms
- Economic conditions
- Functions performed
- Risks assumed

Comparability will have a subjective element, as finding comparable transactions can be challenging if the factors noted above make a specific transaction unique. In addition, multiple methods may have to be tested to determine the "best method" to use. Methods can be grouped into two categories, transactional and profitability. Transactional methods require the identification of comparable transactions to the one in question, and profitability methods are used when identifying specific, reliable transactions is not feasible.

1. Transactional Methods

a. Comparable Uncontrolled Price

Based on actual transactions, the comparable uncontrolled price (CUP) method identifies a transaction involving goods or services that is identical to the transaction in question. This is likely the best estimate of "arm's length."

b. Resale Price

Used for tangible property transactions, the resale price method (RPM) uses list prices less a discount percentage from retail sales to unrelated parties.

c. Gross Margin

Similar to the resale price method, except this method is used for transactions involving services.

d. Cost Plus

The cost plus (C+) method looks at markup percentages applied on actual costs on transactions between unrelated parties. A sampling of these transactions is identified, and an average markup is determined and applied to the cost of the transaction in question.

2. Profitability Methods

a. Comparable Profits Method

Rather than using comparable transactions, the comparable profits method (CPM) looks at companies in similar situations and industries to the company being tested to determine the profit margins (at a high level) of the comparison company. These margins are then used to impute an appropriate profit margin for the tested company. This data is actually easier to find (typically through published financial statements) than data on individual transactions.

b. Transactional Net Margin Method

The transactional net margin method (TNMM) looks at individual transactions (or groups of transactions) from a profitability (rather than price) perspective and then applies that profitability to the tested company's transactions.

c. Profit Split Method

The two methods for applying the profit split method, the comparable profit split method (CPSM) and residual profit split method (RPSM), are based on evaluating the contribution of each tested party to the combined operating profit or loss of the entity as a whole.

(1) Comparable Profit Split

This method uses the combined operating profit of uncontrolled taxpayers with similar transactions or activities to allocate the combined operating profit (or loss) of the tested companies.

(2) Residual Profit Split

This method is applied when one party owns the majority of the intangible assets. The profits are split based on functions performed by the party that does not own the intangible assets, while the residual profit is then allocated to the other related party.

3. Penalties, Rules, and Adjustments

In the United States, the Internal Revenue Service has the authority to adjust prices not found to be within the established arm's length range. The adjustment can be to the midpoint of the range, and a penalty may be assessed depending on the size of the adjustment.

MARGINAL ANALYSIS

Rule: only consider relevant revenues & costs

I. TERMS RELATED TO MARGINAL ANALYSIS

The operational decision method, referred to as *marginal analysis*, is used when analyzing business decisions such as the introduction of a new product or changes in output levels of existing products, acceptance or rejection of special orders, making or buying a product or service, selling or processing further, and adding or dropping a segment. Marginal analysis focuses on the relevant revenues and costs that are associated with a decision.

A. Relevant Revenues and Costs

When making business decisions that will affect future periods, revenues and costs related to those decisions are deemed to be relevant only if they change as a result of selecting different alternatives. Although variable costs are more likely to be relevant because they change with production volume and output, relevant costs can be either fixed or variable.

Relevant costs often share similar characteristics, including their specific traceability to cost objects that may change as a result of selecting different alternatives. Ultimately, a cost's relevance pertains to its potential to affect the decision.

1. <u>Direct Costs</u>

(e.g., DM & DL)

Direct costs are costs that can be identified with or traced to a given cost object. Direct costs are usually <u>relevant</u> (variable costs are generally direct costs).

2. Prime Costs

Prime costs include direct material and direct labor and are generally relevant.

3. <u>Discretionary Costs</u>

Discretionary costs are costs arising from periodic (usually annual) budgeting decisions by management to spend in areas not directly related to manufacturing. Discretionary costs are generally relevant.

EXAMPLE

Costs to maintain landscaping at a corporation's headquarters are generally viewed as discretionary.

4. Incremental Costs

Incremental costs (also known as marginal costs, differential costs, or out-of-pocket costs) are the additional costs incurred to produce an additional amount of the unit over the present output. Incremental costs are relevant costs and include all variable costs and any avoidable fixed costs associated with a decision.

5. Opportunity Costs

An opportunity cost is the cost of foregoing the next best alternative when making a decision. Opportunity costs are <u>relevant</u> costs.

EXAMPLE

- 1. Costs related to a special device that is necessary if a special order is selected are relevant.
- 2. Costs associated with alternative uses of plant space are relevant.

B. Irrelevant Costs

Costs that do not differ among alternatives are irrelevant and should be ignored in a marginal cost analysis.

C. Sunk Costs Not relevant

Sunk costs are costs that are unavoidable because they were incurred in the past and cannot be recovered as a result of a decision. Sunk costs are not relevant costs.

EXAMPLE

Electramag Corporation is evaluating whether to replace a piece of equipment. The cost of the old equipment is a sunk cost and is not relevant to the replacement decision. Additionally, under either alternative (keep the old equipment or replace it), the anticipated cost of electricity remains the same. The cost of electricity is a variable cost. Even so, the cost of electricity is not relevant because it does not change regardless of the selected alternative.

D. Controllable Costs

For any business unit or decision, controllable costs are those that are authorized by the business unit manager or the decision maker. The ability to control cost is evaluated when analyzing business decisions. By classifying a cost as either controllable or uncontrollable, the specific level of management responsible for the cost is identified. Controllable costs are relevant if they will change as a result of selecting different alternatives.

Uncontrollable costs at a specific level are costs that were authorized at a different level.

Uncontrollable costs are not relevant costs because they cannot be changed by the manager making the decision.

EXAMPLE

A manufacturing department manager has control over the materials and supplies used in the manufacturing department (i.e., controllable costs), but that manager has no control over the fixed asset depreciation allocated to the department (i.e., uncontrollable costs).

E. Avoidable Costs and Revenues

Avoidable costs and revenues result from choosing one course of action instead of another. As a result, the firm avoids the cost and revenue associated with the course of action not selected. They are <u>relevant</u> to the decision.

F. Unavoidable Costs Not relevant

Costs that will be the same regardless of the chosen course of action are unavoidable costs that are not relevant to future decisions. These costs will continue regardless of the course of action taken. They have no effect on the decision.

Decision rule:

II. SPECIAL ORDER DECISIONS Accept if price > relevant costs

Special order decisions are defined as opportunities that require a firm to decide whether a specially priced order should be accepted or rejected. Decisions of this character involve a comparison of the special order price to the relevant costs of the decision and an analysis of the strategic issues that relate to the acceptance or rejection of the order.

A. Determining Relevant Costs

Capacity Issues

Special orders are short-term decisions that often assume excess capacity. Fixed costs are generally not relevant to these decisions unless the special order will change total fixed costs.

a. Presumed Excess Capacity Price > VC/unit

If there is excess capacity, a comparison should be made of the incremental costs of the order to the incremental revenue generated by the order. The special order should be accepted if the selling price per unit is greater than the variable cost per unit.

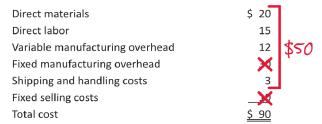
b. Presumed Full Capacity Price > VC/unit + Opportunity cost/unit

If the company is operating at full capacity, the opportunity cost of producing the special order should be included in the analysis.

- (1) The production that is forfeited to produce the special order is the next best alternative use of the facility.
- (2) The opportunity cost is the contribution margin that would have been produced if the special order were not accepted. CM given up Opportunity Size of special order cost/unit

EXAMPLE—SPECIAL ORDER WITH EXCESS CAPACITY

Kator Company is a manufacturer of industrial components. Product KB-96 is normally sold for \$150 per unit and has the following costs per unit:



Kator has received a special, one-time order for 1,000 units of KB-96. Assuming that Kator has excess capacity, what is the minimum acceptable price for this one-time special order?

Solution

The fixed manufacturing overhead and the fixed selling costs are not relevant to the decision. The incremental per-unit production cost is the total variable cost per unit of \$50. Kator should accept the special order only if the selling price per unit is greater than \$50.

EXAMPLE—SPECIAL ORDER WITH NO EXCESS CAPACITY

Assume the same costs as in the previous example. Kator has received a special, one-time order for 1,000 units of KB-96. Assume that Kator is operating at full capacity. Also assume that the next best alternative use of the capacity is the production of LB-64, which would produce a contribution margin of \$10,000. What is the minimum acceptable price for this one-time special order?

Solution

Opportunity cost/unit = $\frac{\$10,000}{1,000}$ = \$10 + \$50 = \$60

Kator's next best alternative use of its capacity would produce a contribution margin of \$10,000. If Kator produces 1,000 units of KB-96, this \$10-per-unit (\$10,000 / 1,000 units) opportunity cost would be added to the variable cost of \$50 to determine the minimum justifiable price for the special order. Kator should accept the special order only if the selling price per unit is greater than \$60.

B. Strategic Factors

The acceptance of a special order also requires consideration of a number of strategic factors, including:

- 1. The effect on regular-priced sales and other long-term pricing issues.
- 2. The possibility of future sales to this customer.
- 3. The possibility of exceeding plant capacity or the complexities of the order itself.
- 4. The pricing of the special order.
- 5. The impact of income taxes.
- 6. The effect on machinery and/or the scheduled machine maintenance program.

Decision rule:

III. MAKE VS. BUY Make if relevant costs < outside purchase price

The decision to make or buy a component (also referred to as insourcing vs. outsourcing) is similar to the special order decision. Managers should select the lowest-cost alternative.

A. Determining Relevant Costs and Other Make or Buy Issues

1. Capacity Issues

a. Excess Capacity Relevant costs = Avoidable costs

If there is excess capacity, the cost of making the product internally is the cost that will be avoided (or saved) if the product is not made. This will be the maximum outside purchase price.

b. No Excess Capacity Relevant costs = Avoidable costs + Opportunity

If there is no excess capacity, the cost of making the product internally is the cost that will be avoided (saved) if the product is not made plus the opportunity cost associated with the decision.

	EXAMPLE			
Offset Manufacturing produces 20,000 units of part No. 125. The production costs are:				
	<u>Total Cost</u>	Cost per Unit		
Direct materials	\$ 10,000	\$.50		
Direct labor	40,000	2.00		
Variable factory overhead	20,000	1.00		
Fixed factory overhead	40,000	2.00		
Total cost	<u>\$110,000</u>	<u>\$5.50</u>		
		X		

An outside manufacturer approaches Offset Manufacturing and offers to sell it the same part for \$5 per unit. Offset has excess capacity. The \$10,000 factory floor supervisor's salary is the only fixed cost that will be eliminated if Offset purchases the part. Should Offset Manufacturing make or buy the part?

Solution

	MAKE		B U	Υ
	Total	Per Unit	Total	Per Unit
Purchase cost			\$100,000	\$5.00
Direct materials	\$10,000	\$0.50		
Direct labor	40,000	2.00		
Variable factory overhead	20,000	1.00		
Fixed factory overhead (avoidable)	10,000	0.50		
Total relevant costs	\$80,000	\$4.00	\$100,000	\$5.00
Difference:	\$20,000	\$1.00		

Offset will choose to make the part because it is the lowest-cost alternative when relevant costs are considered.

B. Strategic Factors

The following strategic factors should be considered when analyzing a make or buy decision:

- The quality of the product purchased compared with the quality of the product manufactured.
- 2. The reliability of the purchased product.
- 3. The value of service contracts or other warranties.
- 4. The risks associated with outsourcing or buying outside the organization, including inflexibility, loss of control, and less confidentiality.
- 5. The most efficient use of the entity's resources.

Decision rule:

SELL OR PROCESS FURTHER Process further if incremental revenue > incremental

The decision regarding additional processing is made based on profitability.

Joint Costs Α.

Joint costs are the costs of a single process that yields multiple products (e.g., the processing of a pig to produce ham, bacon, and pork chops). Joint costs cannot be traced to an individual product. Joint costs are sunk costs that are not relevant to decisions of whether to sell or to process further.

Separable Costs

Separable costs are costs incurred after the split-off point that can be traced to individual products and are relevant to decisions of whether to sell or to process further.

C. **Deciding Factors to Sell or Process Further**

The decision on whether to sell at the split-off point is made by comparing the incremental cost and the incremental revenue generated after the split-off point.

If the incremental revenue exceeds the incremental cost, the organization should process further.

If the incremental cost exceeds the incremental revenue, the organization should sell at the split-off point.

EXAMPLE

Jackson Inc. processes raw materials into beauty products. The Soap Division (Soap) processes fats and lye at a cost of \$200.00 per batch, which yields 2,000 bars of soap. Soap can sell the soap for \$0.50 per bar at this point. Alternatively, various fragrances and oils can be added to produce fine soaps for the high-end retail market from a given batch of raw materials. Soap could incur an additional cost of \$1.20 per bar of soap for the perfumes and attractive packaging and create lavender-scented soap. Or, for an additional cost of \$1.75 per bar, Soap could create rose-scented soap. The high-end soap would sell for \$1.30/bar for the lavender scent and \$3.00/bar for the rose scent.

The Soap Division will not produce the lavender soap because the costs after the split-off point are \$1.20 per bar and the incremental revenue is only \$0.80 (\$1.30 for lavender soap minus the \$0.50 revenue for basic soap). Incremental revenue is less than incremental costs.

If the company decides to produce rose-scented soap, incremental costs are \$1.75 per bar and incremental revenue is \$2.50 (\$3.00 minus \$0.50) per bar. Because the incremental revenue exceeds incremental costs, Soap would produce rose soap.





Lauraber: Incremental cost =
$$$1.20$$

Incremental revenue = $$1.30 - 0.50 = 0.80
Rose: Incremental cost = $$1.75$
Incremental revenue = $$3.00 - 0.50 = 2.50

V. KEEP OR DROP A SEGMENT Decision Rule:

Relevant costs should be used to determine whether to keep or drop a business segment.

A. Classification of Costs

The fixed costs associated with the segment must be identified as either avoidable (relevant) or unavoidable, even if the segment is discontinued.

B. Decision Factors

A firm should compare the fixed costs that can be avoided if the segment is dropped (i.e., the cost of running the segment) to the contribution margin that will be lost if the segment is dropped.

Cost to give up > benefit

- 1. Keep the segment if the lost contribution margin exceeds avoided fixed costs.
- 2. Drop the segment if the lost contribution margin is less than avoided fixed costs.

 Cost to give up < benefit

EXAMPLE-FIXED COSTS ARE UNAVOIDABLE

The executives at Chowderhead Industries are evaluating each of their product lines. A variable costing analysis by product shows that the company's Clam and Corn Chowder products are profitable but its Conch Chowder product is not.

Description	Clam	Conch	Corn	Total
Sales	\$125,000	\$75,000	\$50,000	\$250,000
Variable costs	90,000	60,000	25,000	175,000
Contribution margin	35,000	15,000	25,000 Lost if drop	75,000 Conch
Fixed costs	20,000	20,000	20,000	60,000
Operating Income	\$ 15,000	\$ (5,000)	\$ 5,000	\$ 15,000

The Conch Chowder fixed costs are unavoidable. Should Chowderhead eliminate its Conch Chowder product line?

solution Benefit \$0 < cost \$15,000

If the Conch Chowder fixed costs are unavoidable, they will be incurred even if Conch Chowder is eliminated.

Description	Clam	Conch	Corn	Total
Sales	\$125,000	_	\$50,000	\$175,000
Variable costs	90,000		25,000	115,000
Contribution margin	35,000	_	25,000	60,000
Fixed costs	20,000	20,000	20,000	60,000
Net Income	\$ 15,000	\$(20,000)	\$ 5,000	— NI

The Conch Chowder product line should not be eliminated Elimination of the product would eliminate company-wide profits because the product makes a positive contribution to covering the entity's fixed costs.

EXAMPLE—SOME FIXED COSTS ARE AVOIDABLE

Assume that \$16,000 of the Conch Chowder fixed costs are <u>avoidable</u> advertising costs that will not be incurred if the product is eliminated. Given these new facts, should Chowderhead Industries eliminate its Conch Chowder product line?

Solution

Benefit \$16,000 > cost \$15,000

If \$16,000 of the fixed costs are avoidable, then only \$4,000 are unavoidable and will be incurred even if Conch Chowder is eliminated.

Description	Clam	Conch	Corn	Total
Sales	\$125,000	_	\$50,000	\$175,000
Variable costs	90,000		_25,000	_115,000
Contribution margin	35,000		25,000	60,000
Unavoidable fixed costs	15,000	4,000	16,000	35,000
Avoidable fixed costs	5,000		4,000	9,000
Operating Income	\$ 15,000	<u>\$ (4,000</u>)	\$ 5,000	\$ 16,000 NI
				increa

The Chowderhead executives should eliminate the Conch product line because the avoidable fixed costs exceed the contribution margin that is lost when the product is eliminated. In this case, elimination of the Conch Chowder product line improves overall productivity from \$15,000 to \$16,000.

C. Strategic Factors

Important strategic factors to consider include:

- 1. The complementary character of products and their relationship to the sales of other products. Manufacturers might produce and price certain products as loss leaders to promote sales of more profitable products.
- 2. The impact of product addition or deletion on employee morale.
- 3. The growth potential of each product regardless of individual profitability.
- 4. Opportunity costs associated with available capacity.

FORECASTING AND PROJECTION

I. DECISION MODELS

Data driven decision-making models such as forecasting and sensitivity analysis allow for a formal depiction of the objective, the constraints, and the steps in a process. They may even point to the best solution among tested alternatives.

A. Sensitivity Analysis

Sensitivity analysis is the process of experimenting with different parameters and assumptions regarding a model and cataloging the range of results to view the possible consequences of a decision. Sensitivity models often use probabilities to approximate reality.

Also called "what-if" analysis, sensitivity analysis is a risk management tool that is used to test the effect of specific variables on overall profitability. Managers incorporate sensitivity analysis into the budgeting process to determine which variables are the most sensitive to change and therefore will have the biggest impact on the bottom line.

The biggest drawback of sensitivity analysis is the implicit assumption that variables are independent. The reality is that variables do not typically operate in a vacuum, and a change in one will often result in changes in others that are difficult to predict with accuracy.

EXAMPLE

July sales for Besser Company are projected to be \$100,000, with cost of goods sold of \$60,000 and general/administrative expenses of \$25,000. The CFO has determined that variability in sales has the biggest impact on profitability and she wants to determine the effect on operating income if sales dollars are over-/underestimated by 25%.

In order to estimate the change in operating income, the CFO assumes that cost of goods sold will consistently be 60% of sales and general/administrative expenses will stay constant at \$25,000.

	Sales Overestimated by 25%	Sales Correctly Estimated	Sales Underestimated by 25%
Sales	\$75,000	\$100,000	\$125,000
Cost of goods sold	(45,000)	(60,000)	(75,000)
General/admin.	(25,000)	(25,000)	(25,000)
Operating Income	\$5,000	\$15,000	\$25,000

Because cost of goods sold remains a fixed percentage of sales, and general/administrative expenses remain constant (and therefore independent of sales), the biggest impact on operating income will result from sales being different from estimates.

The CFO can take the analysis a step further to determine the sales amount needed to break even. She calculates that sales of \$62,500 will result in cost of goods sold of \$37,500 (60% of sales). Further subtracting \$25,000 in general/administrative expenses will result in an operating income of zero.

B. Scenario Analysis

In preparing models for future periods, managers may prepare multiple different scenarios which represent alternative possible outcomes. Budgets will be prepared under each scenario and then probabilities may be assigned in order to come up with weighted totals.

EXAMPLE

In preparing its budgets for the coming year, Ridge Company projects three scenarios for revenues:

- Optimistic Scenario (30% likelihood): 5% sales growth
- Pessimistic Scenario (20% likelihood): 5% sales decline
- Most likely scenario (50% likelihood): No sales growth/decline

If sales in the previous fiscal year were \$40 million, projected sales for next year will be:

- Expected sales growth/decline: $(30\% \times 5\%) + (20\% \times -5\%) + (50\% \times 0\%) = 0.5\%$ growth.
- \$40 million x (1.005) = \$40.2 million in projected sales for next year.

C. Forecasting Analysis

Forecasting (probability/risk) analysis is an extension of sensitivity analysis.

Purpose

Forecasting involves predicting future values of a dependent variable (the variable that one is trying to explain) using information from previous time periods. Historical relationships may be examined in order to use predictions about independent variables to forecast changes in dependent variables.

a. Forecasting Revenues

On the revenue side, sales are a dependent variable that may be a by-product of independent variables such as expectations regarding the economy, personal income, product competition, growth of the industry, etc.

b. Forecasting Expenses

On the expense side, total costs are a by-product of specific independent variables such as overall fixed costs and per-unit variable costs.

2. Application

Various quantitative methods (including regression analysis, explained below) are used in forecasting.

II. REGRESSION ANALYSIS $TC = FC + (VC/unit \times Units \text{ produced})$

Linear regression is a method for studying the relationship between two or more variables. One use of linear regression is to predict the value of a dependent variable [e.g., total cost (y)] corresponding to given values of the independent variables [e.g., fixed costs (a), variable cost per unit (B), and production expressed in units (x)].

A. Simple Linear Regression Model

Regression analysis explains variation in a dependent variable as a linear function of one or more independent variables. Simple regression involves only one independent variable. Multiple regressions involve more than one independent variable.

1. Components of the Simple Linear Regression Model

The simple linear regression model takes the following form:

y=a+Bx Assumption: Increase in the number of units produced increases total costs where:

TC y = The dependent variable (the variable we are trying to explain). For example, y might be total costs measured in dollars for a cost function.

Units produced x = The independent variable (the regressor). The variable that explains y. For example, in a cost function, x would be total activity (or output).

FC a = The y-axis intercept of the regression line. For example, if y is total costs, a would measure total fixed costs.

VC/นทโ+ B = The slope of the regression line. For example, if y is total costs, and x is output, B measures the change in total costs due to a one-unit change in output (variable cost per unit).

2. Application

If y is total costs and x is total activity or output, one goal of regression analysis would be to predict total costs (y, the dependent variable) based on observed total activity or output. Questions on the CPA Exam expect you to predict total cost.

B. Statistical Measures to Evaluate Regression Analysis

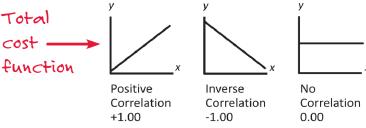
1. The Coefficient of Correlation (r)

a. Definition

The coefficient of correlation measures the strength of the linear relationship between the independent variable (x) and the dependent variable (y). In standard notation, the coefficient of correlation is "r."

b. Interpretation

The range of "r" is from -1.00 to +1.00 as follows:



Correlation coefficient variation

(1) Perfect Positive Correlation (+1.00)

The dependent and independent variables move together in the same direction. An increase (decrease) in the independent variable produces an equivalent increase (decrease) in the dependent variable.

(2) Perfect Inverse Correlation (-1.00)

The dependent and independent variables move in equivalent opposite directions. An increase (decrease) in the independent variable produces an equivalent decrease (increase) in the dependent variable.

(3) No Correlation (0.00)

The dependent and independent variables are not related in a linear fashion. Movement in the independent variable cannot be used to predict the movement in the dependent variable.

c. Projecting Total Cost

When predicting total cost (the dependent variable) as a function of fixed costs, variable costs, and volume (the independent variable), management's expectation is that the correlation coefficient will be somewhere between 0.00 and 1.00. As more units of a given product are produced, a reasonable expectation is that total costs will increase.

2. The Coefficient of Determination (R²)

a. Definition

The coefficient of determination (R²) is the proportion of the total variation in the dependent variable (y) explained by the independent variable (x). Its value lies between zero and one.

b. Interpretation

The higher the R^2 , the greater the proportion of the total variation in y that is explained by the variation in x. That is, the higher the R^2 , the better the fit of the regression line.

EXAMPLE

Based on looking at five years of data on fixed costs and variable costs per unit, Raxan Inc. determines that its fixed and variable costs in the next year will be \$16,000 and \$4.50 per unit, respectively. Raxan has determined that the correlation coefficient between the independent and dependent variable is equal to 0.90. The R^2 for the regression equation Y (total costs) = \$16,000 + \$4.50X, with X being volume, is equal to 0.81. An R^2 of 0.81 means that 81% of the change in total cost during a period can be attributed to changes in volume.

Strong positive correlation

III. LEARNING CURVE

Learning curve analysis is based on the premise that as workers become more familiar with a specific task, the per-unit labor hours will decline as experience is gained and production becomes more efficient. Assuming that demand exceeds capacity, spoilage is minimal, and resources are fully utilized, the increase in production from gained efficiencies will lead to more overall components being needed in the production process.

This analysis is used to set standards and to project costs, as variable costs per unit should decline until a steady-state period is achieved. Once steady state occurs, labor hours per unit will remain constant. In order for learning curve analysis to be applied, the activity itself must be repetitive in nature, involve intense labor, and have little to no labor force turnover or breaks in production. The calculation begins with the first unit/batch. As cumulative production doubles (from one unit to two units, to four units, to eight units, etc.), cumulative average time per unit falls to a fixed percentage (the learning curve rate) of the previous average time.

EXAMPLE

Per unit

Per unit

It takes The Jones Production Company 50 hours to produce the first unit of its only product. Assuming a 70% learning curve:

2 Units

What is the average time it takes Jones to produce 2 units?

Average time (2 units) = $50 \text{ hours } \times 0.70 = 35 \text{ hours}$

What is the total time it takes Jones to produce 2 units?

Total time (2 units) = 35 hours x 2 units = 70 hours

4 Units

What is the average time it takes Jones to produce 4 units? Average time (4 units) = 35 hours $\times 0.70 = 24.5$ hours

What is the total time it takes Jones to produce 4 units?

Total time (4 units) = 24.5 hours x 4 units = 98 hours

8 Units

What is the average time it takes Jones to produce 8 units?

Average time (8 units) = $24.5 \text{ hours } \times 0.70 = 17.15 \text{ hours}$

What is the total time it takes Jones to produce 8 units?

Total time (8 units) = 17.15 hours x 8 units = 137.2 hours

EXAMPLE

It takes The Jones Production Company 50 hours to produce the first unit, and 70 total hours to produce the first two units. What is the learning curve rate?

Solution

70%. (70 total hours for 2 units) / (50 hours x 2 units) = 70 / 100 = 70%.

EXAMPLE

It takes The Jones Production Company 50 hours to produce the first unit, and 35 hours on average, to produce each of the first two units. What is the learning curve rate?

<u>Solution</u>

70%. (35 hours on average for each unit) / (50 hours for the first unit).

IV. HIGH-LOW METHOD

The *high-low method* is a simple technique that is used to estimate the fixed and variable portions of cost, usually production costs.

A. Procedures

1. Gather Data

<u>Compare the high and low volumes and costs</u> (ignoring any obvious aberrations). Outliers, which are unusually high or low volumes, are eliminated.

2. Analyze Data

- a. Divide the difference between the high and low dollar total costs by the difference in high and low volumes to obtain the variable cost per unit.
- b. Use either the high volume or the low volume to calculate the variable costs by multiplying the volume times the variable cost per unit.
- c. Subtract the total calculated variable cost from total costs to obtain fixed costs.

3. Formulate Results

The result enables preparation of a flexible/performance budget by identifying total fixed costs and variable costs per unit. This may be used to estimate total costs at any volume.

B. Flexible Budget Formula

The result of the high-low method is called a total cost formula and, sometimes, a flexible budget formula (or equation).

1. Flexible Budget

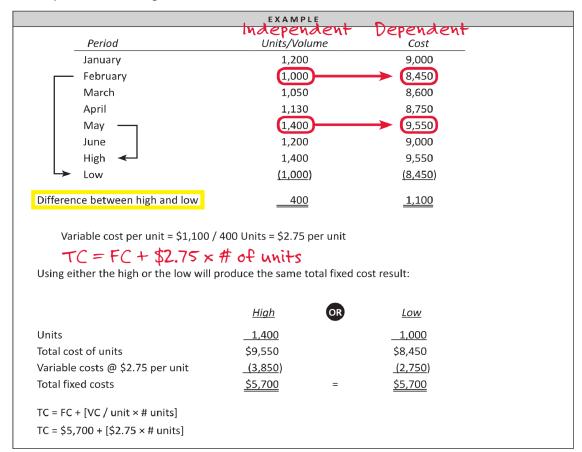
A *flexible budget* is a series of budgets that are prepared for a range of activity levels rather than a single activity (in which variable costs are adjusted to the level of activity and fixed costs are held constant).

2. Formula

This formula defines total costs as equal to the fixed costs plus the variable costs per unit times the units. The flexible budget formula is then used to estimate total cost at any volume.

$$Total\ cost = Fixed\ cost + \begin{bmatrix} Variable\ cost \\ per\ unit \end{bmatrix} Variable Cost + \begin{bmatrix} Variable\ cost \\ Variable \ cost \\ Variable\ cost \\ Variable \ cost \\ Variable\ cost \\ Variable \ cost \\ Variable\ cost \\ Variable\$$

C. Concept Exercise—High-Low Method



$$$9,550 = FC + $2.75 (1,400)$$
 $FC = $5,700$
Ov
 $$8,450 = FC + $2.75 (1,000)$
 $FC = $5,700$

BUDGETING

I. OPERATIONAL AND TACTICAL PLANNING

Operational and tactical planning is the process of determining the specific objectives and means by which strategic plans will be achieved. Tactical plans are short term and cover periods up to 18 months.

A. Single-Use Plans

Tactical plans are also called *single-use plans* because they are developed to apply to specific circumstances during a specific time frame.

B. Annual Budget

An *annual budget* is a (type of) single-use tactical plan. Budgets translate the strategic plan and implementation into a period-specific operational guide. Placing responsibility for achievement of strategic goals in the hands of managers promotes routine accomplishment of strategy as part of the manager's job function.

II. BUDGET POLICIES

To effectively budget, an organization should implement formal budget policies that include the following key features.

A. Management Participation

Typically, a budget will extend for a period of one year and involve numerous individuals. The budget process normally involves a budget committee, which includes members of senior management. The budget committee is charged with resolving disputes and making final decisions regarding major budget changes.

B. Budget Guidelines

Top management should provide *guidelines* for budget preparation based on the entity's strategic goals and long-term plan. These guidelines should include:

1. Evaluation of Current Conditions

- a. Consideration of the changes to the environment since the adoption of the strategic plan.
- b. Organizational goals for the coming period.
- c. Operating results year-to-date.

2. Management Instructions

- a. Setting the tone for the budget (e.g., cost containment, innovation, etc.).
- b. Corporate policies (e.g., mandated downsizing).

III. STANDARDS AND BENCHMARKING

Budgets frequently revolve around the development of standards. Standards have been referred to as per-unit budgets and are integral to the development of flexible budgets.

A. Ideal and Currently Attainable Standards

Standards are often set below expectations to motivate productivity and efficiency, but those standard costs must be revised periodically (generally once a year) to reflect changes in previously determined standards.

1. Ideal Standards

Ideal standards represent the costs that result from perfect efficiency and effectiveness in job performance. Ideal standards are generally not historical; they are forward-looking. No provision is made for normal spoilage or downtime.

a. Advantage

An advantage of using ideal standards is the implied emphasis on continuous quality improvement (CQI) to meet the ideal.

b. Disadvantages

A disadvantage is the demotivation of employees by the use of unattainable standards.

2. Currently Attainable Standards

Currently attainable standards represent costs that result from work performed by employees with appropriate training and experience but without extraordinary effort. Provisions are made for normal spoilage and downtime.

a. Advantage

Fosters the perception that standards are reasonable.

b. Disadvantage

Required use of judgment and potential manipulation.

3. Standard Selection

The best standard is the standard that leads to the accomplishment of strategic goals.

B. Authoritative and Participative Standards

1. Authoritative Standards

Authoritative standards are set exclusively by management.

a. Advantages

➤ Efficient

Authoritative standards can be implemented quickly and will likely include all costs.

b. Disadvantage

Workers might not accept imposed standards.

2. Participative Standards

Participative standards are set by both managers and the individuals who are held accountable to those standards.

a. Advantage

Effective

Workers are more likely to accept participative standards.

b. Disadvantage

Participative standards are slower to implement.

IV. MASTER BUDGETS

A master budget (or "annual business plan") documents specific short-term operating performance goals for a period, normally one year or less. The plan normally includes an operating (nonfinancial) budget as well as a financial budget that outlines the sources of funds and detailed plans for their expenditure.

A. General

1. Purpose

Annual business plans are prepared to provide comprehensive and coordinated budget guidance for an organization consistent with overall strategic objectives.

a. Control Objective

The master budget serves to communicate the criteria for performance over the period covered by the budget.

b. Terminology

Master budgets are alternatively referred to as <u>static budgets</u>, <u>annual business</u> plans, profit planning, or targeting budgets.

c. Use

Annual business plans are appropriate for most industries but are particularly useful in manufacturing settings that require coordination of financial and operating budgets.

2. Components

A master budget generally comprises operating budgets and financial budgets prepared in anticipation of achieving a single level of sales volume for a specified period.

a. Pro Forma Financial Statements

The ultimate output of the annual business plan is a series of pro forma financial statements, including a balance sheet, an income statement, and a statement of cash flows.

b. Assumptions

Pro forma financial statements are supported by schedules that reflect the underlying operating assumptions that produce those statements.

3. (Limitations) of the Annual Plan

a. Master Budget Confined to One Year at a Single Level of Activity

Best when combined with flexible budgets

Budget amounts may be much different from actual results, even though the relationship between expenses and revenues is consistent. An annual static budget divided by 12 (to establish a monthly budget) may exaggerate variances due to seasonal or volume fluctuations.

b. Reporting Output

The product of the process is a set of pro forma financial statements. Although familiar, pro forma financial statements may not provide the type of management information most useful to decision making.

B. Mechanics of Master Budgeting—Overview

The annual business-plan process produces the following budgets and reports:

1. Operating Budgets

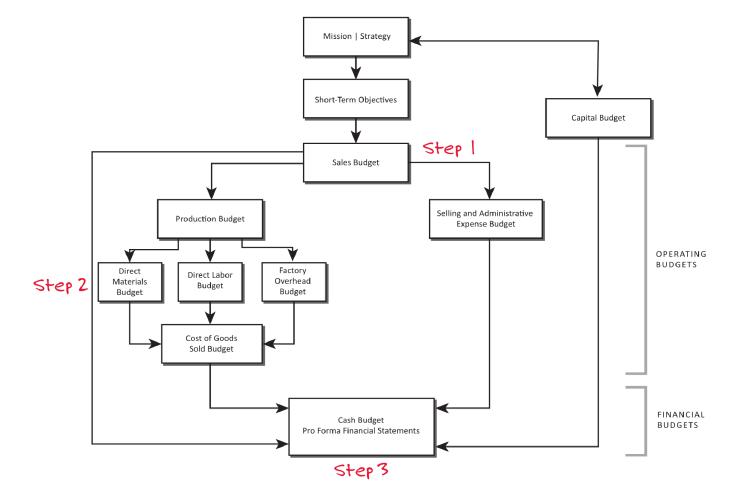
Operating budgets are established to describe the resources needed and the manner in which those resources will be acquired. Operating budgets include:

- a. Sales budgets
- b. Production budgets
- c. Selling and administrative budgets
- d. Personnel budgets

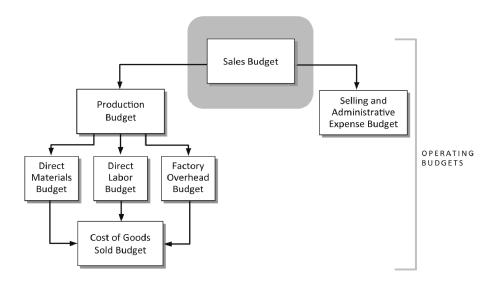
2. Financial Budgets

Financial budgets define the detailed sources and uses of funds to be used in operations. Financial budgets include:

- a. Pro forma financial statements
- b. Cash budgets



V. OPERATING BUDGETS—Sales Budget



The sales budget is the foundation of the entire budget process. The sales budget represents the anticipated sales of the organization in units and dollars. The sales budget is the first budget prepared and it drives the development of most other components of the master budget. Sales budget units drive the number of units required by the production budget. Sales budget dollars drive the anticipated cash and revenue figures. Inventory levels, purchases, and operating expenses are coordinated with sales levels.

A. Sales Forecasting and Budgeting

The sales budget is based on the sales forecast. Sales forecasts are derived from input received from numerous organizational resources, including the opinions of sales staff, statistical analysis of correlation between sales and economic indicators, and opinions of line management. Sales forecasts are developed after consideration of the following factors:

- 1. Past patterns of sales
- 2. Sales force estimates
- 3. General economic conditions
- 4. Competitors' actions
- 5. Changes in the firm's prices
- 6. Changes in product mix
- 7. Results of market research studies
- 8. Advertising and sales promotion plans

EXAMPLE

Blanchforte Stereo is a retailer of audio equipment. Blanchforte's sales manager is working with the controller to develop the sales budget for the next year. Blanchforte's sales manager knows that sales volume is seasonal and that it can be influenced by price and by promotions. The sales manager has developed the following sales forecasts based on units to be sold and average selling price.

Assumptions for Forecasts

First-quarter sales are often weak. The sales manager projects the following sales volumes for aggregate units and average prices.

- 2,000 units at full retail of \$75
- 2,500 units assuming discounts down to \$60

Second-quarter sales strengthen somewhat for graduation and Father's Day promotions. A greater volume and ability to collect full retail can be anticipated based on promotions.

- 3,000 units at full retail of \$75
- 4,000 units assuming discounts down to \$60

Third-quarter sales historically decline despite summer vacation and back-to-school promotions.

- 1,500 units at full retail of \$75
- 2,000 assuming discounts down to \$50

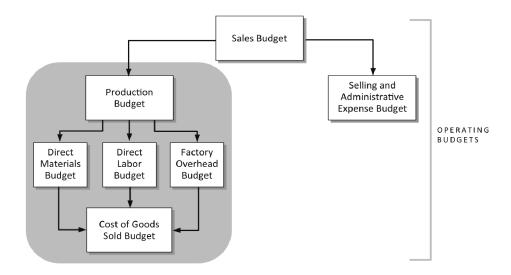
Fourth-quarter sales spike in response to holiday spending.

- 7,000 units at full retail of \$75
- 10,000 units at discounts down to \$60

Blancheforte's sales manager and controller use the sales forecasts to develop the sales budget. Assuming that the company has selected a cost-leadership strategy, it develops the following sales budget that focuses on discounts and volume:

	Q1	Q2	Q3	Q4	Total
Sales (units)	2,500	4,000	2,000	10,000	
Average price	× 60	× 60	<u>× 50</u>	<u>× 60</u>	
Total	<u>150,000</u>	+ <u>240,000</u>	+ <u>100,000</u>	+ <u>600,000</u>	= (1,090,000)

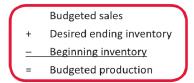
VI. OPERATING BUDGETS—Production Budget



Production/inventory budgets are prepared for each product or each department based on the amount that will be produced, stated in units. The production budget is made up of the amounts spent for direct labor, direct materials, and factory overhead. The amount of the production budget is based on the amounts of inventory on hand and the inventory necessary to sustain sales.

A. Establishing Required Levels of Production

1. The relationship between production, sales, and inventory levels is displayed in the following formula:



2. Desired levels of inventory are normally a function of sales volume and seek to balance the risk of stockouts with the cost of maintaining inventory.

1....

EXAMPLE

Carlisle Manufacturing is trying to estimate the level of production for the month of June. Assume that Carlisle wants safety stock in beginning inventory of 30% of estimated sales and that estimated sales for June and July are as follows:

1.....

1. Compute estimated inventory amounts:

	<u>June</u>	July
Sales	40,000	30,000
Safety stock percentage	<u>× 30</u> %	<u>× 30</u> %
Beginning inventory required	<u>12,000</u>	9,000

2. Compute the estimated production for June:

Budgeted sales for June	40,000
Desired ending inventory - July Bl	+ 9,000
Estimated beginning inventory - June Bl	<u>-12,000</u>
Budgeted production	<u>37,000</u> ← To page 40

3. Other Factors Impacting the Production Budget

- a. Company policies regarding stable production.
- b. Condition of production equipment.
- c. Availability of productive resources.
- d. Experience with production yields and quality.

B. Direct Materials Budge(s)

The direct materials required to support the production budget are defined by the direct materials purchases budget and the direct materials usage budget.

1. Direct Materials Purchases Budget

The *direct materials purchases budget* represents the dollar amount of purchases of direct materials required to sustain production requirements.

a. Number of Units to Be Purchased

The number of units of direct materials to purchase is calculated from the production budget. The formula is:

Units of direct materials needed for a production period

- Desired ending inventory at the end of the period
- Beginning inventory at the start of the period
- = Units of direct materials to be purchased for the period

b. Cost of Direct Materials to Be Purchased

The cost of direct materials purchased is calculated by applying the anticipated cost per unit of direct materials to the computed amount of direct materials to be purchased.

Units of direct materials to be purchased for the period

- × Cost per unit
- = Cost of direct materials to be purchased for the period (purchases at cost)

2. Direct Materials Usage Budget (cost of direct materials used)

The direct materials usage budget represents the number of units of direct materials required for production along with the related cost of those direct materials.

a. The extended costs associated with direct materials are derived as follows:

Beginning inventory at cost

- + Purchases at cost
- Ending inventory at cost
- = Direct materials usage (cost of materials used)

3. Impact of Purchasing Policies

Purchases budgets are influenced by management's philosophy regarding required inventory levels, including safety stock and stockout decisions.

C. Direct Labor Budget

Direct labor budgets anticipate the hours and rates associated with workers directly involved in meeting production requirements. Direct labor hours are computed based on the hours necessary to produce each unit of finished goods.

Budgeted production (in units)

- × Hours (or fractions of hours) required to produce each unit
- = Total number of hours needed
- × Hourly wage rate
- = Total wages

From page 38

EXAMPLE

Carlisle Manufacturing computed its budgeted production at 37,000 units to sustain budgeted sales of 40,000 units in the month of June. Four pounds of direct material are needed to produce each unit of finished product. We assume that new direct materials cost \$10 per pound and that they were previously acquired for \$9 per pound Carlisle has 48,000 pounds on hand at the beginning of June and has a desired direct materials ending inventory of 36,000.

Two hours of direct labor at \$20 per hour are needed to convert the direct materials to finished goods. What are the Direct Materials and Direct Labor budgets for the month of June?

DIRECT MATERIALS PURCHASES

Units of direct materials needed for a production period	
Budgeted production	37,000 units
Pounds of direct material per unit	× 4 pounds
Total pounds needed	148,000 pounds
+ Desired ending inventory at the end of the period	
Pounds of direct material	36,000 pounds
- Beginning inventory at the start of the period	
Pounds of direct material	<u>(48,000</u>) pounds
Direct material to be purchased	136,000 pounds
Cost per pound	× \$10
Direct material purchases	<u>\$1,360,000</u>
DIRECT MATERIALS USAGE BUDGET (cost of direct materials used)	
Beginning inventory at cost (48,000 × \$9)	\$ 432,000
+ Purchases at cost	1,360,000
- Ending inventory at cost (36,000 × \$10)	<u>(360,000)</u>
= Direct materials (usage) (cost of materials used)	\$1,432,000 To COGM
DIRECT LABOR BUDGET	
Budgeted production	37,000 units
Hours of direct labor per unit	× 2 hours
Total hours needed	74,000 hours
Rate per hour	× \$20
Direct labor budget	\$1,480,000 TO COGM

D. Factory Overhead Budget IL + IM + Factory costs

Factory overhead includes the fixed and variable production costs that are not direct labor or direct materials. Factory overhead is applied to inventory (cost of goods manufactured and sold, below) based on a representative statistic (cost driver). Frequently, the rate is applied using direct labor hours.

EXAMPLE

Carlisle Manufacturing uses direct labor hours to apply variable factory overhead and has determined that its variable overhead rate is \$5 per hour. How much variable overhead would Carlisle budget to be applied to the cost of goods manufactured in the month of June if the company used 74,000 direct labor hours according to the direct labor budget?

Solution

Budgeted overhead = 74,000 direct labor hours × \$5 per hour = \$370,000

E. Cost of Goods Manufactured and Sold Budget

The cost of goods manufactured and sold budget accumulates the information from the direct labor, direct material, and factory overhead budgets.

1. Components of the Costs of Goods Manufactured and Sold Budget

a. The cost of goods manufactured represents the sum of the budgets for each element of manufacturing as follows:



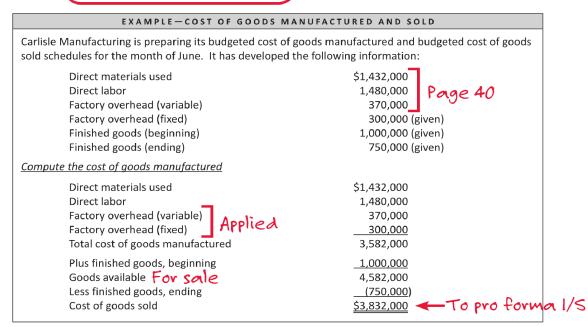
- (1) Direct labor
- (2) Direct material
- (3) Factory overhead Applied
- b. Cost of goods sold considers cost of goods manufactured in relation to beginning and ending inventories of finished goods as follows:

Cost of goods manufactured

+ Beginning finished goods inventory

- Ending finished goods inventory

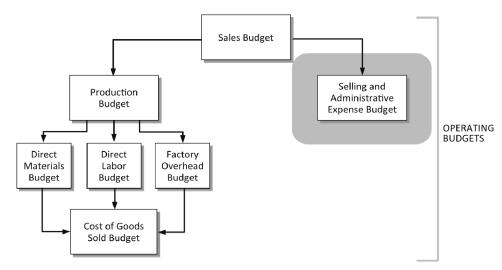
= Cost of goods sold



2. Cost of Goods Sold and the Pro Forma Financial Statements

The budgeted cost of goods sold amount feeds directly into the pro forma income statement. Budgeted cost of goods sold is matched with budgeted sales as a basis for budgeted gross margin.

VII. OPERATING BUDGETS—Selling and Administrative Expense Budget



Selling and administrative expenses represent the fixed and variable nonmanufacturing expenses anticipated during the budget period.

A. Components of Selling and General Administration Expense SG&A

1. Variable Selling Expenses

- a. Sales commissions
- b. Delivery expenses
- c. Bad-debt expenses

2. Fixed Selling Expenses

- a. Sales salaries
- b. Advertising
- c. Depreciation

3. General Administrative Expenses (all fixed)

- a. Administrative salaries
- b. Accounting and data processing
- c. Depreciation
- d. Other administrative expenses

B. Selling and Administrative Expenses and the Pro Forma Financial Statements

Selling and administrative expenses are not inventoried and are budgeted as period costs. Budgeted selling and administrative expenses are matched in their entirety against budgeted sales.

VIII. FINANCIAL BUDGETS—Cash Budgets

Cash budgets represent detailed projections of cash receipts and disbursements. The cash budget is derived from other budgets based on cash collection and disbursement assumptions. Cash budgets provide management with information regarding the availability of funds for distribution to owners, for repayment of debt, and for investment. Cash budgets are generally divided into three major sections:

- Cash available
- Cash disbursements
- Financing

Cash Available Δ

Cash available for use by the organization is normally associated with both balances available at the beginning of the period and cash collections.

Cash Balances = Beginning cash

Cash balances are the amounts of cash on hand that can be used to liquidate expenses. Cash balances that are available for use are limited by management policies relative to minimum cash on hand and compensating balance agreements.

Cash Collections Cash sales from current period
Cash collection of AR from prior period
Cash collection budgets specify the amounts of cash that will be received from sales, 2.

based on the sales budget and from anticipated loan proceeds.

- Cash collection budgets set standards for collections based on current-period sales (usually monthly) and prior-period sales (also usually monthly).
- Cash collection budgets make assumptions regarding the percentage of credit sales b. and the speed at which those collections will occur.

EXAMPLE-CASH COLLECTIONS

Beck-Con Inc. is a U.S. retailer creating its cash budget for September. Based on historical data, it assumes the following information regarding collections:

- 80% of credit sales collected in the next month after sale.
- 18% of credit sales collected in the second month after sale.
- The remaining 2% will not be collected.

Sales data for July – September is estimated as follows:

Month	Type	Sales Dollars		
July	Credit	\$850,000		
August	Credit	\$925,000		
September	Credit	\$700,000		
September	Cash	\$170,000		

September cash collections are calculated as follows:

	July credit sales (\$850,000 x 18%)	\$	153,000
+	August credit sales (\$925,000 x 80%)		740,000
+	September cash sales	_	170,000
	Total cash collections	\$1	,063,000

В.

.Cash paid for current period expenses

Cash Disbursements

Cash paid on AP/accruals from prior periods

Cash disbursements budgets represent the cash outlays associated with purchases and with operating expenses.

Purchases 1.

Cash disbursements budgets (for purchases) indicate the amount that is expected to be paid for purchases.

- Cash disbursements budgets include:
 - (1) Cash purchases for the current period (generally the current month).
 - (2) Credit purchases (accounts payable) for the current period.
 - Cash disbursements required to pay accounts payable during the current period.
- Cash disbursements budgets are developed using the percentage of goods bought on credit, the age of payables liquidated, and the percentage of goods purchased for cash.

2. **Operating Expenses**

Cash disbursements budgets (for operating expenses) specify the amounts paid out to defray the costs of operating expenses.

- Cash disbursements budgets eliminate noncash operating expenses (such as depreciation).
- Cash disbursements budgets include: b.
 - (1) Percentage of prior month expenses to be paid in the current month.
 - Current month expenses for which disbursement is deferred until the (2)following month.
 - Current month expenses paid in cash in the current month.
- C. Cash disbursements consider the effect of accounts payable (other operating expenses) and accrued payroll (wages).

EXAMPLE—CASH DISBURSEMENTS						
To forecast its cash disbursements for September, Beck-Con divided its outflows into the following categories:						
Cost Category	Applicable Dollar Amounts					
Direct materials	\$425,000 to be purchased in August, payable in September.					
Direct labor	\$310,000 to be incurred and payable in September.					
Overhead	\$150,000 in actual costs to be incurred and payable in September.					
Operating expenses	\$145,000 in actual costs to be incurred and payable in September.					
Capital expenditures	\$120,000 (from the capital expenditure budget).					
Tax payments	Tax payments None in September					
Dividends	Dividends \$35,000 payable in September, for the last quarter of the fiscal year.					
September cash disburse	ments are calculated as follows:					
Direct materials	\$ 425,000					
+ Direct labor	310,000					
+ Overhead	150,000					
+ Operating expenses	145,000					
+ Capital expenditures	ures 120,000					
+ Dividends	+ Dividends35,000					
Total cash disbu	rsements <u>\$1,185,000</u>					

C. Financing

Financing budgets consider the manner in which operating (line of credit) financing will be used to maintain minimum cash balances or the manner in which excess or idle cash will be invested to ensure liquidity and adequate returns.

EXAMPLE—FINANCING BUDGET

Beck-Con forecasts a beginning cash balance for September 1 of \$80,000. The company would like to ensure that the ending cash balance is at least \$50,000. In order to accomplish this, it plans to borrow \$95,000 at the end of September from its established line of credit at an annual interest rate of 6%. The first interest payment would not be due until October 31.

D. Cash Budget Formats

Cash budgets represent statements of planned cash receipts and disbursements and are primarily affected by the amounts used in the budgeted income statement. Cash budgets consider:

- 1. Beginning cash
- → 2. Cash collections from sales (add)
- 3. Cash disbursements for purchases and operating expenses (subtract)
- = 4. Computed ending cash
- 5. Cash requirements to sustain operations (subtract)
- = 6. Working capital loans to maintain cash requirements

EXAMPLE-COMBINED CASH BUDGET

Beck-Con's cash budget includes a beginning balance of \$80,000, cash collections of \$1,063,000, cash payments of \$1,185,000, and a letter of credit borrowing of \$95,000. This budget will allow the company to end September with a cash balance of \$53,000, slightly above its minimum threshold.

Beginning cash balance:	\$ 80,000
+ Cash collections	1,063,000
Total cash available	1,143,000
Less cash payments:	(1,185,000)
Ending cash balance (before financing)	\$ (42,000)

Financing:

 Borrowings:
 \$ 95,000

 Interest payments:
 0

 Repayments:
 0

 Ending cash balance:
 \$ 53,000

IX. FINANCIAL BUDGETS—Pro Forma Financial Statements

A. Pro Forma Income Statement

Key components of the budgeted income statement include the data described in the operating budgets:

- 1. Sales budget
- 2. Cost of goods sold budget (derived from the production budgets)
- 3. Selling and administrative expense budget
- 4. Interest expense budget (taken from the cash budget)

B. Pro Forma Balance Sheet

Budgeted balance sheets display the balances of each balance sheet account in a manner consistent with the income statement and cash budget plans developed above. Balance sheet accounts are adjusted for the cash collections and disbursements associated with the cash budget and the noncash transactions accounted for in the income statement.

C. Pro Forma Statement of Cash Flows

The budgeted statement of cash flows is derived from the budgeted income statement, the current and previous budgeted balance sheets, and then reconciled to the cash budget. Cash budgeting has the benefits of displaying the cash effects of the master budget on actual cash flows, assisting in the determination of whether additional sources of financing are required, and evaluating the optimal use of trade credit.

EXAMPLE

The CFO for Packer Company is creating a pro forma income statement for the upcoming fiscal year. The estimated current-year income statement shows:

Sales	\$500,000
Cost of goods sold	(320,000)
SG&A	(60,000)
Interest expense	_(20,000)
Pretax profit (EBT)	\$100,000

For the next fiscal year, the CFO forecasts the following:

- Sales growth of 5%.
- An inventory increase of \$25,000, along with projected cost of goods manufactured of \$365,000.
- An increase in SG&A expenses of \$10,000.
- A pay down of a substantial amount of debt, reducing interest expense by \$15,000.

The pro forma income statement for the upcoming fiscal year will be as follows:

Sales	\$525,000	5% growth over prior year's \$500,000.
Cost of goods sold	(340,000)	COGM of \$365,000 – Increase in inventory balance of \$25,000.
SG&A	(70,000)	Increase of \$10,000 over prior year's \$60,000.
Interest expense	(5,000)	Decrease of \$15,000 over prior year's \$20,000.
Pretax profit (EBT)	\$110,000	Overall \$10,000 increase over prior year's \$100,000.

X. CAPITAL BUDGETS

Capital purchases budgets identify and allow management to evaluate the capital additions of the organization, often over a multiyear period. Financing is a significant component of the capital purchases budget. Capital budgets detail the planned expenditures for capital items (e.g., facilities, equipment, new products, and other long-term investments). Capital budgets are highly dependent on the availability of cash or credit, and they generally involve long-term commitments by the organization.

A. Pro Forma Balance Sheet

Planned additions of capital equipment and related debt from the capital budget are added to the balance sheet.

B. Pro Forma Income Statement

Planned additions of capital equipment are considered in developing budgeted depreciation expense; interest expense associated with planned financing is included as an expense.

C. Cash Budget

Planned financing expenses and principal repayments are included as disbursements on the cash budget.

XI. FLEXIBLE BUDGETING - Use in conjunction with master budget

A flexible budget is a financial plan prepared in a manner that allows for adjustments for changes in production or sales and accurately reflects expected costs for the adjusted output. Analysis focuses on substantive variances from standards rather than just simple changes in volume or activity. Flexible budgets represent adjustable economic models that are designed to predict outcomes and accommodate changes in actual activity. Revenues and expenses are adjusted to display anticipated levels for achieved outputs.

A. Assumptions and Uses

Flexible budgets include consideration of <u>revenue per unit</u>, <u>variable costs per unit</u>, and <u>fixed costs over the relevant range</u> where the relationship between revenues and variable costs will remain unchanged and fixed costs will remain stable.

1. Yield

Flexible budgets consider the amount of cost per unit allowed for units of output.

2. Variance Analysis

Flexible budgets derive the expenses and revenues allowed from the output achieved for purposes of comparison to actual activity and performance evaluation.

B. Benefits and Limitations of the Flexible Budget

1. Benefits

Flexible budgets can display different volume levels within the relevant range to pinpoint areas in which efficiencies have been achieved or waste has occurred.

2. Limitations

Flexible budgets are highly dependent on the accurate identification of fixed and variable costs and the determination of the relevant range. Garbage in, garbage out

EXAMPLE

The Flex-o-matic Corporation produces the Flex-o-matic, a piece of exercise equipment. Corporate Controller Felix Flexmeister is developing a flexible budget. Felix has already developed a master budget but estimates that the relevant range extends 20% above and below the master budget. What is the relevant range in dollars assuming a selling price of \$60 per unit, variable costs of \$40 per unit, fixed costs of \$100,000, and anticipated output according to the master budget of 5,000 units?

Units:	4,000 80% of Master	5,000 Master Budget	6,000 120% of Master
Sales	\$240,000	\$300,000	\$360,000
Variable costs	<u>(160,000</u>)	(200,000)	(240,000)
Contribution margin	80,000	100,000	120,000
Fixed costs	(100,000)	(100,000)	(100,000)
Operating income	<u>\$ (20,000</u>)	<u>\$ 0</u>	\$ 20,000

VARIANCE ANALYSIS

I. ACTUAL VS. PLAN

Variance analysis is a tool for comparing some measure of performance to a plan, budget or standard for that measure. Variance analysis is used for planning and control purposes, and can be used to evaluate revenues and costs. Comparison of actual results to the annual business plan is the first and most basic level of control and evaluation of operations.

A. Performance Report Step 1: budget vs. actual

Actual results may be easily compared with budgeted results. However, usefulness is limited by the existence of budget variances that may be strictly related to volume.

EXAMPLE

Neostar Corporation has prepared its annual business plan for Year 1. The organization anticipated that it would sell 10,000 units of its product at \$15 apiece, that its contribution margin percentage would be 20%, and that its fixed costs would be \$25,000. Actual units sold numbered only 8,000 (totaling \$112,000 in revenues); variable expenses materialized at \$100,800, and fixed costs materialized at \$24,000.

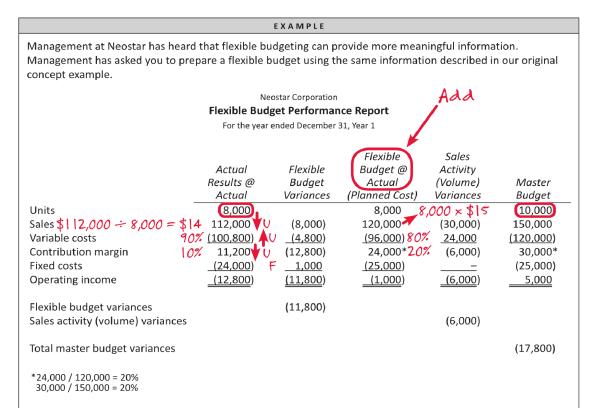
Units:	10,000	8,000		
	Budget	Actual	Variance	_
Revenue	\$150,000	\$112,000	(\$38,000)	Unfavorable
Variable expenses	(120,000)	<u>(100,800</u>)	<u>19,200</u>	Favorable
Contribution margin	30,000	11,200	(18,800)	Unfavorable
Fixed costs	<u>(25,000</u>)	_(24,000)	1,000	Favorable
Net income (loss)	<u>\$ 5,000</u>	<u>\$ (12,800</u>)	<u>\$(17,800</u>)	Unfavorable

Decrease in volume hiding other issues

Variances need significant analysis before they are useful. The favorable variance in variable expenses, for example, does not represent efficiencies. Budgeted contribution margin ratios are 20%; actual contribution margin ratios are 10%. Sales in units were off budget by 20%, yet revenues are down by 25%. Something is very wrong at Neostar, but what?

B. Use of Flexible Budgets to Analyze Performance Step 2: prep. flexible budget

Budget variance analysis becomes progressively more sophisticated as managers review flexible budget comparisons. The flexible budget allows managers to identify how an individual change in a cost or revenue driver affects the overall cost of a process.



Flexible budget variances show that revenue per unit was less than expected, while variable costs per unit were greater than expected. The company has performed \$11,800 worse than expected. Meanwhile, differences in volume produced a \$6,000 unfavorable variance, yielding a total variance from the budget of \$17,800.

Although we still don't know what's wrong with Neostar, we know where to look. Revenues are not materializing as expected despite efforts to discount our selling price (producing an unfavorable sales price variance of \$8,000), and expenses are over budget (producing an unfavorable variable cost variance of \$4,800 despite a favorable fixed-cost variance of \$1,000).

II. VARIANCE ANALYSIS USING STANDARDS

Variance analysis becomes increasingly sophisticated as the investigation of differences between budgeted and actual performance moves from the aggregate examinations associated with either performance reporting or flexible budget analysis to the computation of per-unit variances normally associated with the use of standard costing systems.

A. Standard Costing Systems

Standard costing systems are the most common cost-measurement systems. Standard costs, in the aggregate, measure the costs the firm expects that it *should* incur during production. In a standard costing system, standard costs are used for *all* manufacturing costs (i.e., raw materials, direct labor, and manufacturing overhead).

1. Calculations

a. Direct Costs

Standard price × Standard quantity = Standard direct costs

b. Indirect (Overhead) Costs

Standard (predetermined) application rate × Standard quantity = Standard indirect costs

2. Purposes of Standard Costing Systems

- a. Cost control.
- b. Data for performance evaluations (variance analysis).
- Ability to learn from standards and improve various processes.

B. Variance Calculations Using Standards

1. Standard Cost Objectives

The objective of using a standard costing system is to attain a realistic predetermined or budgeted cost for use in planning and decision making. It also greatly simplifies bookkeeping procedures.

2. Evaluating Variances From Standard

The differences between actual amounts and standard amounts are called variances.

a. Evaluating Results A < S: favorable

An actual cost lower than standard cost is called a *favorable* variance, and an actual cost higher than standard cost is called an *unfavorable* variance.

b. Evaluating Control A > S: unfavorable

If a variance from standard could have been prevented, it is called a *controllable* variance; if not, the variance is known as an *uncontrollable* variance.

3. Product Costs Subject to Variance Analysis

Product costs generally consist of direct materials, direct labor, and manufacturing overhead. A favorable or unfavorable variance in total is a composite of a number of variances. Variances are typically calculated for the following cost elements:

a. Direct materials (DM)



- b. Direct labor (DL)
- c. Variable manufacturing overhead (VOH)
- d. Fixed manufacturing overhead (FOH)

C. Direct Materials and Direct Labor Variance

For direct materials and direct labor, two variances are typically calculated: a price (or rate) variance and a quantity (or efficiency) variance. The variance calculations may be approached in either an equation or a tabular format. Both are presented below:

1. Equation Format

```
DM price variance = Actual quantity purchased × (Actual price – Standard price)

DM quantity usage variance = Standard price × (Actual quantity used – Standard quantity allowed)

DL rate variance = Actual hours worked × (Actual rate – Standard rate)

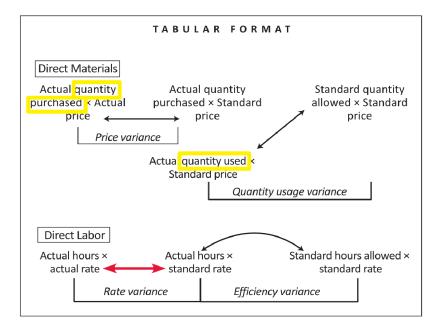
DL efficiency variance = Standard rate × (Actual hours worked – Standard hours allowed)
```

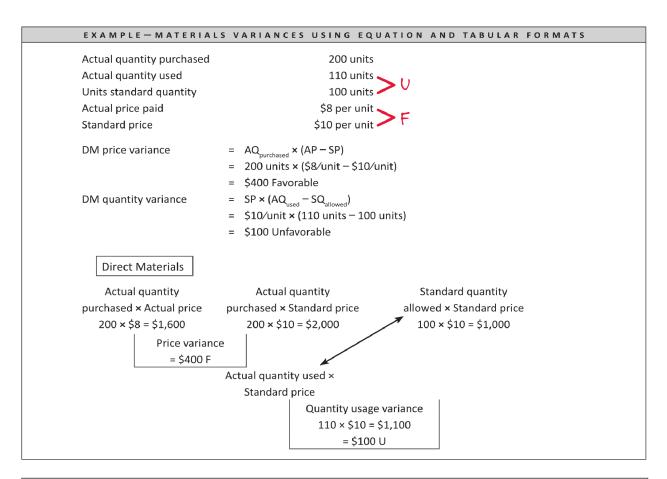
Materials and labor variances are expense variances. When actual price/rate or actual quantity/hours exceed standards, variances are unfavorable. If standards exceed actuals, variances are favorable.

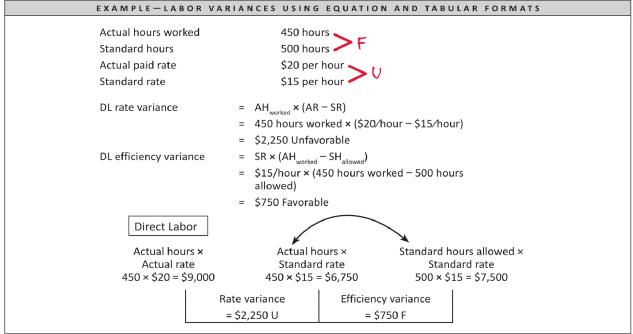
2. Tabular Format

The variance is computed by comparing two totals. If a figure on the left (actual) is larger than a figure on the right (standard), then the variance is unfavorable; if the figure on the left is smaller, the variance is favorable.

The specific variances follow below:







PASS KEY

In addition to the equation and tabular formats, try our **SAD** and **PURE** mnemonics to get you through this tricky area of the exam

1. To determine how the "difference" is calculated in variance analysis, the *difference* is always Standard minus Actual—ALWAYS! It would be **SAD** if you forgot this:

Standard - Actual = Difference

- 2. Recognize the main four types of variances for raw materials and direct labor:
 - P Price variance (for DM)
 - **U** Sage (quantity) variance (for DM)
 - **R** Rate variance (for DL)
 - E Efficiency variance (for DL)
- 3. Memorize how these variances are calculated—Remember your dad always gave you advice about life, and memorizing variance formulas is easy if you remember him! Apply **DADS** twice to set up a schedule you cannot forget!
 - DA <u>D</u>ifference × <u>A</u>ctual
 - **DS** <u>D</u>ifference × <u>S</u>tandard
 - **DA** <u>D</u>ifference × <u>A</u>ctual
 - **DS** <u>D</u>ifference × <u>S</u>tandard

Line up your DADS with PURE:

- P D×A
- U D×S
- R D×A
- E D×S

And, remember, it would be SAD if you forgot how the "difference" amount was calculated!

D. Manufacturing Overhead Variance

At a high level, the analysis of manufacturing overhead compares the actual overhead incurred in a period to the applied overhead in that same period. Overhead is estimated and applied based on a predetermined overhead application rate.

0/H

Applied

1. Underapplied and Overapplied Overhead

If the actual amount of overhead incurred in the period exceeds the amount applied, overhead will be considered underapplied and the overhead account will have a net debit balance. This will result in an unfavorable variance because the actual amount of overhead incurred is higher than expected.

Dr. balance Cr. balance underapplied overapplied

Actual

Unfavorable

(actual > budget)

costs

If the actual amount of overhead incurred is less than the amount applied, overhead will be considered overapplied and the overhead account will have a net credit balance. The variance will be favorable because the actual overhead incurred is less than expected.

Variable and Fixed Overhead Variances

The overall manufacturing overhead variance can be broken into variable and fixed overhead variances. The variable overhead (VOH) variance can be further broken into a rate (spending) variance and an efficiency variance. The fixed overhead (FOH) variance can be divided into a budget (spending) variance and a volume variance. Although the variable and fixed overhead spending variances can be combined for calculation purposes, they serve different functions from a strategic/analytical perspective.

Know this

PASS KEY

The equations for the four overhead variances are as follows:

- VOH rate (spending) variance = Actual hours x (Actual rate Standard rate
- VOH efficiency variance = Standard rate x (Actual hours Standard hours allowed for actual production volume)
- FOH budget (spending) variance = Actual fixed overhead Budgeted fixed overhead
- FOH volume variance = Budgeted fixed overhead Standard fixed overhead cost allocated to production*

(*based on Actual production x Standard rate)

3. Establishing Overhead Application Rates

Overhead rates are applied using various cost drivers that most appropriately assign the components of overhead cost pools to production. Predetermined fixed and variable overhead rates are established by dividing planned fixed and variable overhead amounts by a suitable cost driver.

4. Application of Overhead

Overhead is applied to production based on the predetermined rate per cost driver times the standard cost driver allowed for the actual level of activity (hours worked, units produced, etc.).



PASS KEY

When standard costing is used, the application of overhead is accomplished in two steps:

Step 1: Calculated overhead rate = Budgeted overhead costs ÷ Estimated cost driver

Step 2: Applied overhead = Standard cost driver for actual level of activity × Overhead rate (from Step 1)

5. Interpretation

Overhead variances represent the analysis of balance in the overhead account after overhead has been applied. Overapplied overhead (more credit) is favorable, as it will ultimately result in a credit to cost of goods sold at the end of the period and therefore a reduction in expenses (and increase in profits). Underapplied (more debit) is unfavorable, as the eventual debit to cost of goods sold will increase expenses and therefore decrease profits. Each component of the variance computation follows the same logic.

- a. If the number on the right is greater than the number on the left (more credit), then the variance is favorable.
- b. If the number on the left is greater than the number on the right (more debit), then the variance is unfavorable.
- The sum of all variances equals the net balance in the overhead account.

6. Variable Manufacturing Overhead Variances

a. Variable Overhead Rate (Spending) Variance

VOH rate (spending) variance = Actual hours x (Actual rate – Standard rate)

This variance tells managers whether more or less was spent on variable overhead than expected. A favorable variance occurs when the standard rate exceeds the actual rate, which is beneficial to a company because it means that it paid less per labor hour than anticipated. An unfavorable variance occurs when the actual rate exceeds the standard rate, which means that the company paid more per labor hour than it expected to spend.

U: actual > budget

F: actual < budget

b. Variable Overhead Efficiency Variance

VOH
efficiency = Standard x (Actual hours – Standard hours allowed for actual production volume)

F: use less cost driver U: use more cost driver

This variance is tied to the efficiency with which labor hours are utilized. The efficiency variance isolates the amount of total variable overhead variance that is due to using more or fewer direct labor hours than what was budgeted (assuming that direct labor hours is the cost driver). In other words, given what was produced in terms of output, did it require more or fewer labor hours than anticipated? A favorable variance results from using fewer labor hours than budgeted, and an unfavorable variance stems from using more labor hours than budgeted.

- 7. Fixed Manufacturing Overhead Variances
 - a. Fixed Overhead Budget (Spending) Variance

F: actual < budget U: actual > budget

FOH budget (spending) = variance	Actual fixed overhead	_	Budgeted fixed overhead
--	-----------------------	---	-------------------------

Companies budget an amount for fixed overhead costs every period, and this variance focuses at a high level on whether more or less was spent than budgeted. All of the actual fixed overhead costs are summed for the period and the total actual overhead is compared with the budgeted amount of fixed overhead. A favorable variance occurs when actual fixed overhead costs are less than budgeted, and an unfavorable variance results from actual fixed overhead costs exceeding the budgeted amount.

b. Fixed Overhead Volume Variance

FOH volume Budgeted fixed cost allocated to production*

Fixed overhead costs are typically applied using a rate derived from budgeted fixed overhead costs and expected volume (the cost driver). When the actual volume produced differs from the amount used to calculate the fixed overhead application rate, there will be a variance. A favorable variance occurs when volume is higher than anticipated, which implies that more units were produced using the same amount of fixed resources. An unfavorable variance occurs when volume is lower than anticipated, as fewer units were produced using a fixed amount of resources.

F: volume produced > budget U: volume produced < budget

a.k.a. Production Volume Variance

Production

volume = (Actual production - Budgeted production) × standard

variance

variance

rate

^{*}based on Actual production x Standard rate

, Cost driver

EXAMPLE

Lucy Inc. produces widgets and applies overhead costs based on direct labor hours. The table below provides budgeted and actual information on the number of widgets, labor hours, variable overhead costs, and fixed overhead costs for January. Using this information, calculate the rate and efficiency variable overhead variances, the budget and volume fixed overhead variances, and the overall overhead variance. (Actual - Applied)

Number of Widgets					
Budgeted number of widgets 4,000 widgets					
Actual number of widgets	3,800 widgets	U - actual volume < budge	+		
	Labor Hours				
Standard labor hours required per widget	1.00 labor hour				
Standard labor hours total (based on actual production)	3,800 hours	(3,800 widgets x 1.00 labor hour per widget)			
Actual labor hours used 3,900 hours U - used more hours than b				ed	
	Variable Overhead				
Standard VOH Rate	\$1.50 per hour	U-actual rate higher			
Actual VOH Rate	\$1.60 per hour				
Actual VOH Costs	\$6,240	(3,900 hours x \$1.60 per hour)			
	Fixed Overhead				
Standard FOH per widget	\$3.00 per hour	= \$12,000 ÷ 4,000 budgeted	units		
Budgeted FOH Costs	\$12,000	(4,000 budgeted widgets x 1.00 labor hour per widget x \$3.00 per hour)			
Actual FOH Costs	\$10,560	F-spent less than budget			

VOH rate (spending): 3,900 hours x (\$1.60 – \$1.50) = \$390 Unfavorable

VOH efficiency: \$1.50 x [3,900 hours – (3,800 x 1.00 hour)] = \$150 Unfavorable

FOH budget (spending): \$10,560 - \$12,000 = \$1,440 Favorable

FOH volume: \$12,000 - *\$11,400 = \$600 Unfavorable

*3,800 hours budgeted (for production of 3,800 widgets) x \$3 per hour = FOH applied to production using standard hours allowed

Adding all of the variances together produces a total overall favorable variance of \$300: \$390U + \$150U - \$1,440F + \$600U = \$300F.

Overall variance: \$16,800 actual - \$17,100 applied = \$300 Favorable (Overapplied - \$300 in "excess"

Actual overhead (FOH + VOH): \$16,800

Actual FOH: \$10,560 Actual VOH: \$6,240

Applied overhead (FOH + VOH): \$17,100

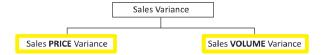
applied O/H needs to be removed from (OGS)

Applied FOH: \$11,400 [3,800 standard labor hours (to produce 3,800 widgets) x \$3.00 per hour] Applied VOH: \$5,700 [3,800 standard labor hours (to produce 3,800 widgets) x \$1.50 per hour]

Inte	erpre	tation	Driver
1.	Spe	ending (VOH and FOH)	
	a.	VOH rate: \$390 Unfavorable	VOH rate was higher than anticipated
	b.	FOH budget: \$1,440 Favorable	Spent less than anticipated on FOH
2.	Effi	ciency (VOH only)	
	a.	VOH efficiency: \$150 Unfavorable	Took longer per unit than anticipated
3. Volume (FOH only)			
	a.	FOH volume: \$600 Unfavorable	Produced fewer units than budgeted

E. Sales and Contribution Margin Variances

Sales and contribution margin variance analyses can be used to evaluate the effectiveness of an entity's identification of target markets and its strategies to capture those markets. The sales variance (the difference between actual sales revenue and budgeted sales revenue) has various components, as described below.



1. Sales Price Variance (or sales revenue flexible budget variance)

The sales price variance measures the aggregate impact of a selling price different from the budget.

Sales price variance =
$$\left[\frac{\text{Actual SP}}{\text{Unit}} - \frac{\text{Budgeted SP}}{\text{Unit}}\right] \times \text{Actual sold units}$$

a. Strategy and Mission

Firms might reduce prices in an effort to move into a cost leadership strategy or increase prices in an effort to put a differentiation strategy into place. Variance results have specific implications in analyzing the effectiveness of a firm in reaching its target markets.

b. Interpretation

A favorable variance in price (the actual sales price exceeds the budgeted sales price) can result in untapped profit potential for a firm. If a firm plans to increase its market share or sales volume simply by reducing sales prices, however, it can risk reducing the profitability of the firm if the expected volume increase is not enough to cover the reduction in price.

EXAMPLE

In Cascade Company's January budget, the company shows 3,000 budgeted units sold, a sale price of \$16 per unit, and variable costs of \$10 per unit. The company actually sells 4,000 units at a price of \$14 per unit. Calculate Cascade's sales price variance for January.

Sales price variance = $(\$14 - \$16) \times 4,000 = \$8,000$ Unfavorable. This variance is unfavorable because the per-unit selling price was less than anticipated.

2. Sales Volume Variance

The sales volume variance is a flexible budget variance that distills volume activity from other sales performance components. The basic sales volume variance is:

A favorable variance exists when more units are sold than budgeted, and an unfavorable variance occurs when budgeted units exceed actual units.

EXAMPLE

In Cascade Company's January budget, the company shows 3,000 budgeted units sold, a sale price of \$16 per unit, and variable costs of \$10 per unit. The company actually sells 4,000 units at a price of \$14 per unit. Calculate Cascade's sales volume variance for January.

Sales volume variance = $(4,000 - 3,000) \times 6 = 6,000$ Favorable. This variance is favorable because the company sold more units than it anticipated. 6 - 6 = 6,000 Favorable. This variance is favorable because the

RESPONSIBILITY ACCOUNTING

I. ORGANIZATIONAL UNITS

Financial scorecards take many forms, including budget versus actual and other variance reports, as well as overall analysis of business performance. Financial performance is often a function of organizational decisions and the performance objectives given to each segment.

A. Types of Responsibility Segments

Responsibility segments, sometimes referred to as strategic business units (SBUs), are generally classified by four financial measures (performance objectives) for which managers may be held accountable. SBUs are highly effective in organizing performance requirements and in establishing accountability for financial responsibility.

1. Cost SBU

Managers are held responsible for controlling costs.

Only hold managers 2. responsible for what they can control

Revenue SBU

Managers are held responsible for generating revenues.

3. Profit SBU

Managers are held responsible for producing a target profit (accountability for both revenues and costs).

4. Investment SBU

Managers are held responsible for return on the assets invested to produce the earnings generated by the SBU.

B. Establishing Designs for Financial Scorecards

The feedback function links planning, control, and performance evaluations and is integral to evaluating and reporting performance.

1. Accurate and Timely

Feedback must be accurate and timely to be effective.

2. Understandable

Performance measurement reports must be tailored to the audience receiving them to ensure that they are understood and that they are focused on the accountability measures.

3. Specific Accountability

Strategic business units isolate a financial level of accountability for managers. The effectiveness of each strategic business unit is often subdivided into additional categories including:

a. Product Lines

Some strategic business units involve multiple products. Costs, sales, profits, or returns associated with each of these products can be analyzed for further insight into the sources of profits or losses.

b. **Geographic Areas**

Strategic business units also cross geographic boundaries. Performance can generally be traced by geographic location or geographic market to provide additional insight into results.

c. Customer

Often the most significant segment classification is a classification by major customer. The relative profitability or losses associated with any one customer may influence management's decisions to either drop the customer or to reevaluate the relationship in regard to any marginal benefits to the business (e.g., contribution of the customer to fixed costs, etc.).

C. Accounting Decisions—Allocation of Common Costs

Managers have control over variable costs and over controllable fixed costs. Performance evaluations dealing with controllable margins will factor in these costs. Common costs are not controllable. Approaches to the rational allocation of central administrative costs must be understood by responsible managers and must be fair and logical. Employees are more motivated to achieve corporate goals if they believe that common costs do not represent an arbitrary burden.

II. ANALYSIS OF BUSINESS PERFORMANCE—Contribution Reporting

Profit SBUs are normally responsible for generating a level of profit in relation to controllable costs. Contribution reporting formats are generally used to clearly show the degree to which the profit that strategic business units have generated has covered variable or controllable costs.

A. Contribution Margin

Contribution margin measures the excess of revenues over variable costs (or the contribution to fixed costs) for a company or division.

B. Controllable Margin

Contribution by SBU is a refinement of contribution margin reporting and represents the difference between contribution margin and controllable fixed costs. Controllable fixed costs are costs that managers can influence in less than one year (e.g., advertising and sales promotion).

C. Concept Example

The following concept example displays the manner in which a contribution by an SBU might be displayed in a financial scorecard for a profit SBU.

EXAMPLE

Delta Manufacturing has four regions that it has organized into Profit Strategic Business Units. Delta's Management has designed a financial performance evaluation report that focuses on contribution margin and controllable margins. The report is designed as follows:

	Delta Manufacturing Performance Evaluation					
					Untraceable	
	Region 1	Region 2	Region 3	Region 4	Costs	Total
Revenues	200	300	150	450	-	1,100
Variable costs	(150)	(250)	(125)	(350)	-	(875)
Contribution margin	50	50	25	100	-	225
Controllable fixed costs	(25)	(25)	(10)	(50)	-	(110)
Controllable margin	25	25	15	50	-	115
Noncontrollable fixed costs	(15)	(15)	(6)	(44)	-	(80)
Contribution by SBU	10	10	9	6	-	35
Untraceable costs	-	-	-	-	(20)	(20)
Operating Income	10	10	9	6	(20)	15

III. BALANCED SCORECARD

The balanced scorecard gathers information on multiple dimensions of an organization's performance defined by critical success factors necessary to accomplish the firm's strategy. Critical success factors are classified as:

- F · Financial Responsibility segment/SBU
- 1 · Internal business processes Efficient/effective operations
- C · Customer satisfaction Customers happy
- Advancement of innovation and human resource development (learning and growth) Employees

Typically, the scorecard describes the classifications of critical success factors, the strategic goals, he provided the tactics, and the related measures associated with strategic and tactical goals.

EXAMPLE

Instafab Manufacturing is building its business using a cost leadership strategy. The management of Instafab has identified four strategic goals, one associated with each classification of critical success factors, to help its business grow. The strategic goals are:

- 1. Capturing additional market share F
- 2. Maintaining low costs that are supported by low prices
- 3. Becoming a low-price leader C
- 4. Linking strategy with reward and recognition A

Help Instafab design tactics to achieve its strategic goals, define measures it might use, and organize them in the manner of a balanced scorecard.

Legend:

- 1. Critical Success Factors (those items in bold)
- 2. Strategic Goals (those items in italics)
- 3. Tactics and Measures (those items in regular font)

Tactics	Measures
FINANCIAL PERSPECTIVE:	
Capture increasing market share	Company vs. industry growth
Maintain customer base	Volume trend line
Steadily expand services	% of sales from new products
INTERNAL BUSINESS PROCESSES:	
Maintain low costs that are supported by low prices	Costs compared to competitor
Improve distribution efficiency	% of perfect orders
Maintain consistent production	First pass rates
CUSTOMER PERSPECTIVE:	
Become a low-price leader	Our cost vs. competition
Increase customxer satisfaction	Customer surveys
Anticipate customer needs before competitors	% of products in R&D being test marketed
ADVANCE LEARNING AND INNOVATION (H	UMAN RESOURCES):
Link strategy with reward and recognition	Net income per dollar of variable pay
Promote entrepreneurial culture	Annual reports

Business 3

Financial Management

1.	Capital budgeting	3
2.	Leverage	21
3.	The weighted average cost of capital and optimal capital structure	23
4.	Asset effectiveness and efficiency	30
5.	Working capital management	39
6.	Appendix: Summary of formulae and ratios	52
7	Class quastions	57

NOTES

CAPITAL BUDGETING

Relevant after-tax

I. CASH FLOWS RELATED TO CAPITAL BUDGETING

Add value

Capital budgeting is a process for evaluating and selecting the long-term investment projects of the firm. Proper capital budgeting is crucial to the success of an organization. The amount of cash the company takes in and pays out for an investment affects the amount of cash the company has available for operations and other activities of the company.

A. Cash Flow Effects

1. Direct Effect

When a company pays out cash, receives cash, or makes a cash commitment that is directly related to the capital investment, that effect is termed the direct effect. It has an immediate effect on the amount of cash available.

2. Indirect Effect



Transactions which <u>indirectly are associated with a capital project</u> or which represent noncash activity that produces cash benefits or obligations are termed indirect cash flow effects.

EXAMPLE



Depreciation is a noncash expense taken as a tax deduction. Depreciation reduces the amount of taxable income and, consequently, the related taxes. The reduced tax bill resulting from increased depreciation expense associated with a new project decreases the cash paid out. This type of effect is termed an indirect effect (or tax effect) of capital budgeting.

3. Net Effect

The total of the direct and indirect effects of cash flows from a capital investment is called the net effect.

*B. Stages of Cash Flows

Cash flows exist throughout the <u>life cycle</u> of a capital investment project. There are three general stages in which cash flows are categorized.

1. Inception of the Project (time period zero) - Today's cost = Initial outflow

Both direct cash flow effects (the acquisition cost of the asset) and indirect cash flow effects (working capital requirements or disposal of the replaced asset) occur at the time of the initial investment. The initial cash outlay for the project is often the largest amount of cash outflow of the investment's life.

a. Working Capital Requirements = Net CA

Working capital is defined as current assets minus current liabilities When a capital project is implemented, the firm may need to increase or decrease working capital to ensure the success of the project.

(1) Additional Working Capital Requirements "Buy" WC \$ out-flow

A proposed investment may be expected to increase payroll, expenses for supplies, or inventory requirements. This may result in an indirect cash outflow that is recognized at the inception of the project because part of the working capital of the organization will be allocated to the investment project and will be unavailable for other uses in the organization.

(2) Reduced Working Capital Requirements "Sell" WC \$↑

Implementing a just-in-time inventory system (in which the amount of inventory required to be on hand is reduced) represents a decrease in current assets and is recognized as an indirect cash inflow at the inception of the project.

Step 1: "Net" initial cost b.

Disposal of the Replaced Asset - Offsets cost of new

(1) Asset Abandonment

SP - NBV = G or L

+ Increase in WC = out. - Net proceeds sale old = In.

Invoice + Ship. + Install. = Out. If the replaced asset is abandoned, the net salvage value is treated as a reduction of the initial investment in the new asset. The abandoned asset's book value is considered a <u>sunk cost,</u> and therefore <u>not relevant</u> to the decision-making process. The remaining book value (for tax purposes) is deductible as a tax loss, which reduces the liability in the year of abandonment. This tax liability decrease is considered a reduction of the new asset's initial investment. SP In.

- Gain xT Out. "Net" proceeds sale old (2) Asset Sale

+ Loss × T In. If a new asset acquisition requires the sale of old assets, the cash received from the sale of the old asset reduces the new investment's value. If a gain or loss (for tax purposes) exists, there is also a corresponding increase or decrease in income taxes. The amount of income tax paid on a gain on a sale is treated as a reduction of the sales price (which increases the initial expenditure). Conversely, a reduction in tax resulting from a loss on a sale is treated as a reduction of the new investment.

Step 2: "Inflow" Operations = Future annual OCF = Inflow

The ongoing operations of the project will affect both direct and indirect cash flows of the company.

- Pretax $CF \times (1 T)$ The cash flows generated from the operations of the asset occur on a regular basis.
- These cash flows may be the same amount every year (an annuity) or may differ. +
- Depreciation tax shields create ongoing indirect cash flow effects. Depr. x T

Disposal of the Project - One-time terminal year CF = Inflow Disposal of the investment at the end of the project produces direct or indirect cash flows.

+ Decr. WC = In. - Gain x T = Out.

+ Loss x T = In.

Net inflow

- If the asset is sold, there is a direct effect for the cash inflow created on the sale and an indirect effect for the taxes due (in the case of a gain) or saved (in the case of a loss).
- Certain direct expenses may be incurred for the disposal (e.g., severance pay) = Out.
- If the asset is scrapped or donated, there may be a tax savings (an indirect effect) if the net tax basis is greater than zero (i.e., the asset has not been fully depreciated).
- d There may be indirect effects associated with changes in the amount of working capital committed once the project is disposed of (e.g., employees who worked on the project may no longer be needed). A working capital commitment that was recognized as an indirect cash outflow at the inception of a project is recognized as an indirect cash inflow at the end of the project when the working capital commitment is released.



C. Calculation of Pretax and After-Tax Cash Flows

Pretax Cash Flows Sales ↑ and/or expenses ↓

The traditional computation of an asset's value is based on the cash flows it generates. Thus an investment's value is often based on the present value of the future cash flows that investors expect to receive from the investment. Larger cash outflows than inflows may indicate that a project is unprofitable.

2. After-Tax Cash Flows = Pretax
$$CF \times (1 - T)$$
a. General + Depr. $\times T$

Annual OCF

After-tax cash flows are relevant to capital budgeting decisions and are computed as follows:

- (1) Estimate net cash inflows (cash inflows minus cash outflows).
- (2) Subtract noncash tax deductible expenses to arrive at taxable income.
- (3) Compute income taxes related to a project's income (or loss) for each year of the project's useful life.
- (4) Subtract tax expense from net cash inflows to arrive at after-tax cash flows.
- (5) Alternatively, multiply net cash inflows by (1 Tax rate) and add the tax shield associated with noncash expenses (noncash tax shield such as depreciation multiplied by the tax rate). The sum of these two amounts will equal the aftertax cash flows. Refer to the concept example below for further detail.
- (6) The tax savings or expense related to a particular cash flow equals the amount of the expense or income times the firm's marginal income tax rate.



	1 A X 3	MPLE				
Compute after-tax cash flows ba						
Annual cash inflows	\$40,000					
Depreciation	\$10,000					
Tax rate	40%					
Transaction Data		Pretax		After-Tax		
Cash inflows		\$40,000	× (1 – 40%) =	\$24,000		
Depreciation		_10,000	× 40% =	+ 4,000	St	e
Pretax income		30,000		\$28,000	= An	n
Tax rate		(12,000)			0	Ŧ
Net income		\$18,000				٠,
After-Tax Cash Flows						
Cash inflows		\$40,000				
Taxes		(12,000)				
After-Tax Cash Flows		<u>\$28,000</u>				

b. Additional Taxation Issues

- (1) Operating cash flows can differ from net income.
- (2) All taxes reported on an income statement may not be applicable to the current year. Further, actual taxes paid may exceed the tax estimate made on the income statement.

Changes in working capital will represent a source or use of cash but are not taxed when computing tax expenses on cash flows.

PASS KEY

- Multiply pretax cash flow by (1 Tax rate) as a shortcut to compute the after-tax cash flows.
- Multiply noncash tax shield items (such as depreciation) by the tax rate as a component of total after-tax cash flows.

Comprehensive Concept Example—Cash Flows for Capital Budgeting

The following comprehensive example is broader in scope than a multiple-choice guestion but addresses the following cash flow issues associated with all of the below:

- Determining total cash outflow (similar in concept to asset capitalization).
- Computing after-tax cash inflows after consideration of both the net cash inflows and depreciation tax shield.
- Computing the effect of salvage value in the final year.

<u>Facts</u>

The divisional management of Carlin Company has proposed the purchase of a new machine that will improve the efficiency of the operations in the company's manufacturing plant. The purchase price of the machine is \$425,000 Costs <u>associ</u>ated with putting the machine into service include \$10,000 for shipping \$15,000 for installation, and \$6,000 for the initial training.

EXAMPLE

Carlin expects the machine to last (6) years and to have an estimated salvage value of \$7,000. The machine is expected to produce 4,000 units a year with an expected selling price of \$800 per unit and prime costs (direct materials and direct labor) of \$750 per unit. \$800 - \$750 = \$50 EBT x 4,000 units = \$200,000 pretax

Tax depreciation will be computed under the accelerated straight-line rules (not MACRS) for five-year property with no consideration for salvage value (i.e., the entire asset amount capitalized will be depreciated). Carlin has a marginal tax rate of 40%.

\$200,000

(80,000)

36,480

\$200,000

(80.000)

[\$200,000 × 0.40]

[per above]

[per above]

 $[(\$456,000 / 5) \times 0.40]$

Cash Flow at the Beginning of the First Year for Capital Budgeting Analysis

Sample Year: Net Cash Flow for Years 1–5 for Capital Budgeting Analysis

depreciation on machine

Initial investment

Net cash flow from sales

Less: Taxes on net sales Add: Net indirect effect of

Net cash flow from sales

Add: Net indirect effect of

Less: Taxes on net sales

Total

The net cash outflow at the beginning of the first year is calculated as follows:

\$(425,000) Add: Increase in WC N/A Shipping (10,000) Less: Net proceeds sale old N/A (15,000) Installation Training (6,000)\$(456,000) [Outflow]

Step 2:

 $\frac{456}{5} = 91.2$

Initial outflow

Step 1:

Annual OCF

Total <u>\$156,480</u> [Inflow] Net Cash Flow for the FINAL (Year 6) for Capital Budgeting Analysis

 $200 \times (1 - .40) = 120$ $0 \times .40$ Last OCF no depreciation in Year 6

124.2

 $[4,000 \times (\$800 - \$750)] \ 200 \times (1 - 40) = 120$

depreciation on machine Salvage value SP = 7,000 4,200 [$$7,000 \text{ gain} \times 0.60$, which is net of tax] > \$124,200 [Inflow] Proceeds on sale - Tax on gain

Net TYCF © DeVry/Becker Educational Development Corp. All rights reserved

B3-6

Business 3

★II. DISCOUNTED CASH FLOW (DCF) < NPV

DCF valuation methods (including the net present value and the internal rate of return methods discussed below) are <u>techniques that use time value of money concepts to measure the present</u> value of cash inflows and cash outflows expected from a project.

A. Objective and Components of Discounted Cash Flow as Used in Capital Budgeting

The objective of the discounted cash flow (DCF) method is to focus the attention of management on relevant cash flows appropriately discounted to present value. The factors used to evaluate capital investments under discounted cash flow include the dollar amount of the initial investment, the dollar amount of future cash inflows and outflows, and the rate of return desired for the project.

- -Hurdle 1. rate
- Discount rate
- 1. Rate of Return Desired for the Project Compensation for all visk assumed

The rate used to discount future cash flows is set by management using several different approaches.

- ... a. Management may use a weighted average cost of capital (WACC) method.
- b. Management may simply assign a target for new projects to meet.
- c. Management may recommend that the discount rate be related to the risk specific to the proposed project. If the proposed project is similar in risk to the ongoing projects of the company, WACC is appropriate because it reflects the market's assessment of the average risk of the company's projects.

2. Limitation of Discounted Cash Flow—Simple Constant Growth Assumption

Discounted cash flow methods are widely viewed as superior to methods that do not consider the time value of money; however, <u>discounted cash flow methods do have an important limitation—they frequently use a simple constant growth (single interest rate) assumption. This assumption is often unrealistic because, over time, as management evaluates its alternatives, actual interest rates or risks may fluctuate.</u>

★ B. Net Present Value Method (NPV)

- NPV allows r to change - IRR no

1. Objective

The *net present value method* of capital budgeting is one of several discounted cash flow techniques used to screen capital projects for implementation.

a. Objective of the Net Present Value Method

The objective of the net present value method is to focus decision makers on the initial investment amount that is required to purchase (or invest in) a capital asset that will yield returns in an amount in excess of a management-designated hurdle rate.

b. Basis of Evaluation

NPV requires managers to evaluate the dollar amount of return rather than either percentages of return (as described below for the internal rate of return method) or years to recover principal (as described for the payback methods) as a basis for screening investments.

- 2. Calculation of Net Present Value
- 2) Annual OCF
- a. Estimate the Cash Flows
- 3) Final year CFs

Estimate all direct and indirect after-tax cash flows (both inflows and outflows) related to the investment.

(1) Ignore Depreciation unless a tax shield) Depr. x T = \$ saved = Inflow

As with DCF methods, depreciation is ignored except to the extent that it reduces tax payments (i.e., a tax shield). Use of accelerated (instead of straight-line) depreciation methods increases the present value of the depreciation tax shield.

Step 2

(2) (Ignore Method of Funding

The method of funding has no effect on the net present value model. NPV uses a hurdle rate to discount cash flows. The method of financing the project and the related cost are independent of the process of screening investment alternatives under NPV.

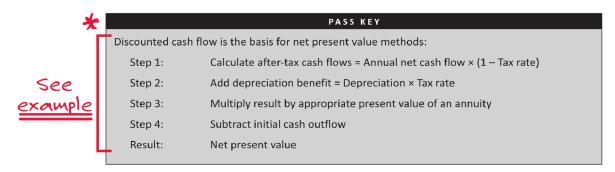
Discount the Cash Flows b.

Discount all cash flows (both inflows and outflows) to present value using the appropriate discount factor based on the hurdle rate and the timing of the cash flow. The net present value method assumes that the cash flows are reinvested at the same rate used in the analysis.

IRR assumes CFs reinvested at IRR

C. Compare

Compare the present values of inflows and outflows.



3. Interpreting the NPV Method

The investment decision is based on whether the net present value is positive or negative. Note that if the net present value is equal to zero, management would be indifferent about accepting or rejecting the project.

Positive Result = Make Investment Sum of PVFCF > cost Profit a.

IRR > hurdle If the result is positive (greater than zero), the rate of return for the project is greater than the hurdle rate (the discount percentage rate used in the net present value calculation) and the investment should be made. If the company has unlimited funds, all projects with a net present value greater than zero should be accepted. Project ranking and acceptance techniques in circumstances involving limited capital are described below.

Negative Result = Do Not Make Investment Sum of PVFCF < cost Value ↓

IRR < hurdle

If the result is negative (less than zero), the rate of return for the project is less than the hurdle rate and the investment should not be made because it does not meet management's minimum rate of return. A negative NPV means that the internal rate of return on the investment is less than management's hurdle rate for the project.

Interest Rates Adjustments for Required Return Yes for NPV

Avantage Net present value analysis may incorporate many types of hurdle rates, such as the cost of capital (the average rate of return demanded by investors), the interest rate of the opportunity cost, or some other minimum required rate of return. All rates are determined by management.

Adjustments to Rate

Rates may be modified (generally increased) to adjust for:

(1) Risk Rate PVFCF

$$\frac{\text{FV}}{(1+v)} = \text{PV} \checkmark$$

Discount rates may be increased to further factor differences in risk into the analysis.

EXAMPLE

Management would select a high hurdle rate for certain projects to factor risk into its consideration of acceptance of those projects. The higher hurdle rate discounts (reduces) future cash flows more, creating a smaller present value, which stands a larger chance of yielding an NPV below zero, with the project not being selected. By "devaluing" the cash flows for a certain project, the NPV model compensates for risk.

(2) Inflation (also affects cash flows) Loss of purchasing power Rates may be raised to compensate for expected inflation.

EXAMPLE

Assume that management anticipates higher-than-normal inflation. To compensate for the falling value of the dollars it anticipates from its cash flows, the interest rate (discount factor) may be increased. In addition, the future cash flows also should be increased to the extent of predicted inflation. If management anticipates no change in tax rates, cash flows generated from the effects of depreciation would not be adjusted because they relate to the original investment.

Differing Rates - Major advantage of NPV over IRR

Different rates may be used for different time periods using the NPV method. For example, 12 percent might be the rate for the first three years, and 15 percent (which reflects a greater risk) might be the rate for subsequent years. If the NPV is greater than zero, the project will be acceptable.

IRR limited to a single discount rate

PASS KEY

The NPV method of capital investment valuation is considered to be superior to the internal rate of return (IRR) method (discussed below) because it is flexible enough to consistently handle either uneven cash flows or inconsistent rates of return for each year of the project.

Discount Rate Applied to Qualitatively Desirable or Non-optional Investments

A project that meets qualitative management criteria for investment (e.g., mandated technology investments) is purely subject to financing, rather than capital budgeting, considerations. The discount rate used for NPV evaluation should be the after-tax cost of borrowing, sometimes called the incremental borrowing rate.

Applying the Net Present Value Method to Business Decisions

The following comprehensive concept example is broader in scope than a multiplechoice question but demonstrates the treatment of several significant issues, including fluctuating depreciation amounts, the computation of after-tax cash flows, the discounting of uneven cash flows, computations associated with salvage value, and the calculation of net present value.

Per Page 6

Assume that Carlin Company requires a 12% annual return in order to invest in this new machine purchase. Calculate the net present value (NPV) of the machine purchase and determine whether Carlin should invest in the project.

EXAMPLE-NET PRESENT VALUE

- 12% Annuity factor, 5 years = 3.605 Use to discount annual OCF
- 12% PV factor, 6 years = 0.507 Use to discount a one-time FCF Like TYCF Solution

As shown in the earlier example, the present values of the outflow and inflows are as follows:

Initial outflow: $(456,000) \times 1.00 = (456,000)$

proceed with making the investment in the machine.

Cash inflows, Years 1-5 156,480 k 3.605 = 564,110.40 Sum of PVFCF = 627,079.80 Cash inflow, Year 6 124,200 x 0.507 = 62,969.40 Less: cost <456,000.00>

By summing the present values together, the NPV can be calculated:

(456,000) + 564,110.40 + 62,969.40 = 171,079.80. Because the NPV is a positive number, Carlin will

Future CF

IRR > 12% hurdle (discount rate)

Is sum of PVFCF > 150

EXAMPLE—NET PRESENT VALUE

<u>Facts</u>

1) Initial outflow

McLean Inc. is considering the purchase of a new machine that will cost \$150,000 The machine has an estimated useful life of three years Assume for simplicity that the equipment will be fully depreciated for tax purposes 30%, 40%, and 30% in each of the three years, respectively. The new machine will have a \$10,000 resale value at the end of its estimated useful life. The machine is expected to save the company \$85,000 per year in operating expenses. McLean uses a 40% estimated income tax rate and a 16% hurdle rate to evaluate capital projects.

Discount rates for a 16% rate are as follows:

tes for a 16% rate are as to	ollows:	2) 001	
FCF "aiffer"	Present Value of \$1	Present Value of an Ordinary Annuity of \$1	→ FCF "same"
Year 1	0.862	0.862	each year
Year 2	0.743	1.605	
Year 3	0.641	2.246	

<u>Requirement</u>

What is the net present value of this project, and should this project be accepted if there are unlimited funds available in the capital budget?

Solution

Annual Depreciation Shield

First, calculate the annual depreciation tax shield as follows (Depreciation x Tax rate):

Step 2

Cost of asset Depreciation % Annual depreciation Tax rate Tax shield

Years 1 and 3 (30%) Year 2 \$150,000 \$150,000 30% 40% \$ 45,000 \$ 60,000

Annual Savings

Calculate the after-tax annual savings as follows [Savings \times (1 – Tax rate)]:

Year 1

Annual savings = \$85,000 [savings per year] $\times (1 - 0.40)$ Annual savings = $$85,000 \times 0.60$

Year | 51+18 Final year 3 51 + 18+

Year 3

3. Salvage Value Inflow

Step 3: Calculate the salvage value inflow as follows:

Annual savings = \$51,000

Proceeds from salvage Inflow \$10,000

Less: Basis of machine [fully depreciated]

Gain on salvage \$10,000 Less: Taxes (4,000) [\$10,000 × 40%] \$ 6,000 Cash inflow $[$10,000 \times (1-0.40)]$

Year 0

Net Present Value Schedule and Calculation

Equipment cost Depreciation tax shield Annual savings Salvage value inflow	\$(150,000)	\$18,000 51,000	\$24,000 51,000	\$18,000 51,000 6,000	[from 1, above] [from 2, above] [from 3, above]	
After-tax cash flow Discount rate Present value	(150,000) × 1.00 (150,000)	69,000 × 0.862 59,478	75,000 × 0.743 55,725	75,000 × 0.641 48,075	IF <u>all</u> FCF = \$13,278	75,000 × 2.246 P

Year 2

© DeVry/Becker Educational Development Corp. All rights reserved.

6. Advantages and Limitations of the Net Present Value Method

a. Advantages

The net present value method is flexible and can be used when there is no constant rate of return required for each year of the project.

b. Limitations

Even though NPV is considered the *best* single technique for capital budgeting, the net present value method of capital budgeting is <u>limited by not providing the true</u> rate of return on the investment. The NPV purely indicates whether an investment will earn the "hurdle rate" used in the NPV calculation.

7. Capital Rationing

The concept of capital rationing describes how limited investment resources are considered as part of investment ranking and selection decisions.

a. Unlimited Capital

Ideally, a company has virtually unlimited resources at its disposal, so the company may do everything (or nearly everything) that meets the company's screening criteria. Investments are undertaken in the order that they are ranked. If a company has unlimited capital, all investment alternatives with a positive NPV should be pursued.

b. Limited Capital

Realistically, a company has extremely limited resources that make its investment choices mutually exclusive (i.e., if one investment is chosen over another, the company does not have the option of "hedging its bet" with the second alternative because resources are entirely committed).

(1) Importance

Capital budgeting decisions involve a tremendous amount of money, time, and risk. If the company is down to two mutually exclusive choices, the importance of clearly defined calculations is just that much more critical.

(2) Ranking and Acceptance

If capital is limited and must be rationed, managers will allocate capital to the combination of projects with the maximum net present value. The ranking of projects from a group of qualifying investments (those that exceed the hurdle rate) is best accomplished using the profitability index (described below) and becomes especially important when projects are independent (i.e., mutually exclusive).

Ranking 8.

8. Profitability Index PVFCF - Cost vs. PVFCF - Cost

The profitability index is the ratio of the present value of net future cash inflows to the present value of the net initial investment. The profitability index is also referred to as the excess present value index or simply the present value index. Ranking and selection of investment alternatives anticipate positive net present values for all successfully screened investments. The profitability ratio will likely be over 1.0, which means that the present value of the inflows is greater than the present value of the outflows.



a. Measures Cash Flow Return per Dollar Invested

The profitability index measures cash-flow return per dollar invested; the higher the profitability index, the more desirable the project.

b. Application

Projects that meet the screening criteria (e.g., positive NPV) are ranked in descending order by their profitability index. Limited capital resources are applied in the order of the index until resources are either exhausted or the investment required by the next project exceeds remaining resources.

EXAMPLE-CAPITAL RATIONING

Facts

Example: Beaman Enterprises has \$50,000 of capital to invest in new projects for the coming fiscal year. The company must decide which projects to invest in given its budget constraints. The chart below shows the initial cost of the five investment options, along with the calculated present value of the future cash inflows.

Project	Denominator Initial Investment	Numerator PV Future Inflows
Α	\$16,000	\$25,000
В	\$4,000	\$7,000
С	\$30,000	\$38,000
D	\$8,000	\$11,000
Е	\$25,000	\$42,000

Ranking the investments using the profitability index, which project options will Beaman choose to pursue?

Solution

The first step is to calculate the profitability index for each project, which is done by dividing the present value of future inflows by the present value of the initial investment.

Project	ct PV Future Inflows		Initial Investment		Profitability Index
А	\$25,000	÷	\$16,000	=	1.5625 3
В	\$7,000	÷	\$4,000	=	1.75 Highest
С	\$38,000	÷	\$30,000	=	1.267 5 Lowest
D	\$11,000	÷	\$8,000	=	1.375 4
Ε	\$42,000	÷	\$25,000	=	1.68 2

The second step is to rank the projects from highest profitability index to lowest. The order would then be: Projects B, E, A, D, C.

The third and final step is to add the initial investments until the company's \$50,000 threshold is reached.

B + E + A =
$$$4,000 + $25,000 + $16,000 = $45,000$$
. $< 50,000$

The next best project, which is D, would cost Beaman \$8,000 and would push the company over the threshold of \$50,000. Therefore, the projects Beaman will choose are projects B, E, and A.

Internal Rate of Return (IRR)

It is the single rate that will set the PVFCF = Today's cost - zero NPV

The IRR is one of several discounted cash flow methods used to screen the acceptability of investments. The IRR is the expected rate of return of a project and is sometimes called the time-adjusted rate of return. The IRR method determines the present value factor (and related interest rate) that yields an NPV equal to zero. (The present value of the after-tax net cash flows equals the initial investment on the project.)

PASS KEY

IRR does not lend itself to effective testing in a multiple-choice format. The likelihood of seeing computational questions in this area is remote; however, having a general understanding of the concepts that underlie this technique is important as a basis for comparing and contrasting IRR to the NPV method.

1. **Objective**

The IRR method focuses the decision maker on the discount rate at which the present value of the cash inflows equals the present value of the cash outflows (usually the initial investment).

PASS KEY

Although the NPV method highlights amounts, the IRR method focuses decision makers on percentages.

Interpreting IRR for Investment Decisions

Using IRR, the targeted rate of return or hurdle rate is predetermined and is compared to the computed IRR. Note that management would be indifferent about accepting or rejecting the project if the IRR were equal to the hurdle rate.

+ NPV PI>1 Accept When IRR > Hurdle Rate

Projects with an IRR greater than the hurdle rate will be accepted.

Reject When IRR < Hurdle Rate - NPV

Projects with an IRR less than the hurdle rate will be rejected.

Limitations of IRR (Inferior to NPV) 3

Unreasonable Reinvestment Assumption

Cash flows from the investment are assumed in the IRR analysis to be reinvested at the internal rate of return. If internal rates of return are unrealistically high or unrealistically low, assumed returns on reinvested cash flows based on IRR rates could lead to inappropriate conclusions.

b. Inflexible Cash Flow Assumptions

The timing or the amount of cash flows used to determine IRR can be misleading when compared to the NPV method. The IRR method is less reliable than the NPV method when there are several alternating periods of net cash inflows and net cash outflows or the amounts of the cash flows differ significantly. IRR and NPV may rank investments differently if the cash flow amounts and timing differ significantly.

Evaluates Alternatives Based Entirely on Interest Rates C.

The IRR method evaluates investment alternatives based on the achieved IRR and does not consider the amount of the profit.

Does not tell you \$ value added like NPV

other <u>methods</u>

EXAMPLE

If an investment of \$50 earns \$100, then there is a 200% return [100 / 50 = 200%]. If an investment of \$50,000 earns \$25,000, then there is a 50% return [25 / 50 = 50%]. The IRR method would suggest that it would be best to invest \$50 to earn \$100 and receive a 200% return, while the NPV method would favor the larger \$25,000 NPV on the \$50,000 investment.

III. PAYBACK PERIOD METHOD

The payback period is the time required for the net after-tax cash inflows to recover the initial investment in a project.

A. Objective of Payback Period Method

The payback period method focuses decision makers on both liquidity and risk.

1. Liquidity

The payback period method measures the time it will take to recover the initial investment in the project, thereby emphasizing the project's liquidity and the time during which return of principal is at risk.

2. Risk - Longer time = Risk 1

The payback method is often used for risky investments. The greater the risk of the investment, the shorter the payback period that is expected (tolerated) by the company.

* B. Calculation

The formula for calculating the payback period is as follows:



C. Cash Flow Assumptions

1. Uniform Cash Inflows

The net cash inflows are generally assumed to be constant for each period during the life of the project. The payback period is computed at the point of initial investment using after-tax cash flows. Cash flows involve the following factors:

a. Project Evaluation

In the case of a project, the net cash inflow would be the net cash receipts associated with the project.

b. Asset Evaluation

In the case of the purchase of equipment, the net annual cash inflow will be the savings generated by use of the new equipment.

c. Depreciation Tax Shield

Depreciation expense is not considered, except to the extent that it is a tax shield.

Numerator

EXAMPLE

Initial outflow

Helena Company is planning to acquire a \$250,000 machine that will provide increased efficiencies, thereby reducing annual operating costs by \$80,000. The machine will be depreciated by the straightline method over afive-year life with no salvage value at the end of five years. Assuming a40% income tax rate, calculate the machine's payback period.

Solution

Facts

1. Calculate the annual net cash savings (also referred to as the average expected cash flows) as follows:

Expected cash flow savings		\$80,000 × (14	10) = \$48,000
Net income increase	\$80,000	50.000 ×	40 = +20,000
Less: Annual depreciation	(50,000)	30,000 71	
Net income before income taxes	\$30,000		<u>\$68,000</u>
Multiplied by 40% tax rate	× 40%	<u>(12,000</u>)	1000
Net cash savings		<u>\$68,000</u>	Annual OCF
Calculate the payback period, as follows:			"Annuity"

$$\frac{\text{Investment}}{\text{Net cash savings}} = \frac{\$250,000}{\$68,000} = \frac{3.68}{\$68,000} \text{ years}$$

Non-uniform Cash Flows (use cumulative approach) 2.

The standard payback formula shown above applies to uniform annual cash inflows. If cash flows are not uniform (i.e., they vary from period to period over the life of the project), a cumulative approach (rather than the standard payback formula) to determine the payback period is used.

Accumulate Until Equal to Initial Net Investment

The net after-tax cash inflow per year is used as the basis for the evaluation of projects with non-uniform cash flows. These net after-tax cash inflows are accumulated until the time that they equal the initial net investment.

b. **End of the Payback Period**

The point at which the cumulative net after-tax inflows equal the initial net investment is the end of the payback period.

Initial outflow

EXAMPLE

<u>Facts</u>

Radon Technologies is considering the purchase of a new machine costing \$200,000 for its surfboard manufacturing plant in San Diego, CA. The management of Radon estimates that the new machine will last approximately four years and will be directly responsible for efficiencies that will increase the company's after-tax cash flows by the following amounts (non-uniform cash flow):

Cumulative Amounts \$90,000 All of years 1 + 2 Year 1 \$90.000 170,000 Part of year 3 * In year 3 80,000 Year 2 Year 3 75,000 $200 - 170 = \frac{30}{75} = .40$ 60,000 Year 4 305,000 Requirement

What is the payback period for this investment?

Solution

The cumulative cash flows reach the initial investment amount of \$200,000 sometime in Year 3. Therefore, the payback period would be more than two years and less than three years. Assume that the cash flow is earned evenly throughout the year. The payback period is then calculated as follows:

Amount of cash flow in Year 3 needed to attain \$200,000 cumulative cash flows:

Percentage of Year 3 until cumulative amount of \$200,000 is attained:

2 + 0.40 = 2.40 years payback

Advantages and Limitations of Payback

Advantages of the Payback Method

Easy to Use and Understand

The simplicity of the objective and the absence of complex formulas or multiple steps make the payback method easy to use and understand.

b. **Emphasis on Liquidity**

The computation focuses management on return of principal. The method's emphasis on liquidity is a very important consideration when making capital budgeting decisions (e.g., most companies will prefer shorter payback periods, all other factors being equal).

Limitations of the Payback Method **2**.

- The time value of money is ignored. See discounted payback a.
- Project cash flows occurring after the initial investment is recovered are not b. considered.
- Reinvestment of cash flows is not considered. C.
- d. Total project profitability is neglected.

IV. DISCOUNTED PAYBACK METHOD IMProvement

Companies may use the discounted payback method as an alternative to the nondiscounting payback method described above. This variation computes the payback period using expected cash flows that are discounted by the project's cost of capital (the method considers the time value of money). Discounted payback is also referred to as the breakeven time method (BET)

A. Objective of Discounted Payback

The objective of the discounted payback method (or BET) is to evaluate how quickly new ideas are converted into profitable ideas.

1. Focus on Liquidity and Profit - Not all profit

The measure focuses decision makers on the number of years needed to recover the investment from discounted net cash flows. Profit is built into cash flows using the discount rate.

2. Evaluation Term

The computation begins when the project team is formed and ends when the initial investment has been recovered (based on cumulative discounted cash flows).

3. Common Projects Using Discounted Payback

Discounted payback (or BET) is often used to evaluate new product development projects of companies that experience rapid technological changes. These companies want to recoup their investment quickly, before their products become obsolete.

B. Advantages and Limitations of Discounted Payback

The advantages and limitations of discounted payback are the same as the payback method (except that discounted payback incorporates the time value of money, a feature ignored by the payback method). Both focus on how quickly the investment is recouped rather than overall profitability of the entire project.

Applying Discounted Payback to Business Decisions

EXAMPLE

Facts

Initial outflow

Radon Technologies is considering the purchase of a new machine costing \$200,000 for its surfboard manufacturing plant in San Diego, CA. The company's discount rate for projects of this type is 10%. The management of Radon estimates that the new machine will last approximately four years and will be directly responsible for efficiencies that will increase the company's after-tax cash flows by the following amounts (non-uniform cash flow):



The present value interest factors for 10% are as follows:

Year 1	0.909
Year 2	0.826
Year 3	0.751
Year 4	0.683

What is the discounted payback period for this investment?

Solution

1. Calculate the Present Value of the Future Cash Flows

ulate the Present Value of the Future Cash Flows					DCF		
Year	Cash Flow Increa	se	Discount Factor		10% PV of Cash Flow	Cumulative (PV)	
Year 1	\$90,000	×	0.909	=	\$81,810	\$81,810	1+2
Year 2	80,000	×	0.826	=	66,080	147,890	•
Year 3	75,000	×	0.751	=	56,325	204,215 - Part	of yv. 3
Year 4	60,000	×	0.683	=	40,980	245,195	,
	\$305,000				\$245,195		

Determine the Discounted Payback Period

The cumulative present value reaches the initial investment amount of \$200,000 in Year 3. Therefore, the discounted payback period would be more than two years and less than three years. Assume that the cash flow is earned evenly throughout the year. The discounted payback period is then calculated as follows:

Amount of cash flow in Year 3 needed to attain \$200,000 cumulative cash flows:

- CF needed in year 3 \$200,000 - \$147,890 (Year 2's cumulative amount) = \$52,110

Percentage of Year 3 until cumulative amount of \$200,000 is attained:



Business 3

PASS KEY

Calculating Time Value of Money Without Factors

Although the CPA Exam often will provide factors for use in time value of money calculations, it is very helpful for candidates to understand how to calculate these factors in the event that they are not given on the exam.

Present Value of \$1

The formula to calculate present value is as follows:

$$PV = \frac{FV}{(1+r)^n}$$

Where:

PV = present value

FV = future value

r = interest rate

n = number of years

Example: What is the factor for the present value of \$1 to be received two years in the future at an interest rate of 6 percent?

$$PV = \frac{FV}{(1+r)^n} = \frac{1}{(1.06)^2} = 0.890$$

Present Value of Annuity Step 1: Calculate PV factor for 1 = .890

The formula to calculate the present value of an annuity is as follows:

$$PV = PMT \times \frac{1 - \frac{1}{(1 - r)^n}}{r}$$

Step 2:
$$\frac{1 - .890}{.06} = \frac{.11}{.06} = 1.8333$$

Where:

PMT = annuity payment

Example: What is the factor for the present value of \$1 to be received in each of the next three years at an interest rate of opercent?

Step 1: $\frac{1}{(1.06)^3} = .839619$

$$PV = 1 \times \frac{\left[1 - \frac{1}{(1.06)^3}\right]}{0.06}$$

= 2.673

Step 2:
$$\frac{1 - .839619}{.06} = \frac{.16}{.06} = 2.673$$

Use of fixed costs - amplifies & Risk assumed LEVERAGE

Leverage affects the variability of company profits and, therefore, affects the risk assumed (and return required) by creditors and owners. Leverage is a significant consideration as a factor in designing capital structure. Financial managers must consider both operating leverage and financial leverage.

OPERATING LEVERAGE - Depr. and vent - total cost independent of sales

Definition

Operating leverage is the degree to which a company uses fixed operating costs rather than variable operating costs. Capital-intensive industries often have high operating leverage. Labor-intensive industries generally have low operating leverage.

Implications DOL: B.

% A EBIT A company with high operating leverage must produce sufficient sales revenue to cover its high fixed-operating costs. High operating leverage is beneficial when sales revenue is high. % A Sales High contribution margin indicates high operating leverage.

> A company with high operating leverage will have greater risk but greater possible returns. There is risk because the variability of profits is greater with higher operating leverage. When sales decline, a company with high operating leverage may struggle to cover its fixed costs. However, beyond the breakeven point, a company with higher fixed costs will retain a higher percentage of additional revenues as operating income (earnings before interest and taxes or EBIT). Because total cost N/C

$$DOL = \frac{+21\%}{+5\%}$$

$$DOL = \frac{10\%}{5\%}$$

21% When Pat Jones compared his company's operating leverage with a competitor's operating leverage, Jones -found that his company experienced a21%increase in EBIT as a result of a5%increase in sales, while the competitor experienced a 10% increase in EBIT as a result of a 5% increase in sales. Jones' company has higher operating leverage than the competitor, which implies that fixed costs constitute a higher proportion of his company's total costs compared with the competitor. As a result, Jones' company will need to generate more revenue to cover its fixed costs, but will be highly profitable once those fixed costs are met.

EXAMPLE—HIGH OPERATING LEVERAGE

Nursing homes and hospitals are required to meet minimum staffing levels to maintain bed capacity. Salaries represent a fixed cost of maintaining capacity and result in higher operating leverage.

EXAMPLE-LOW OPERATING LEVERAGE

Big box retailers have high variable operating costs in their cost of goods sold and part-time labor pool, resulting in low operating leverage

$$+5\% \times 2 = +10\%$$

%
$$\Delta$$
 sales \times DOL = % Δ operating income

FINANCIAL LEVERAGE - Use of debt - interest expense fixed cost "independent of sales" II. **Definition**

When making financing decisions, a firm can choose to issue debt or equity. When debt is issued, the firm generally must pay fixed interest costs. Equity issuances do not result in an increase in fixed costs because dividend payments are not required. Financial leverage is the degree to which a company uses debt rather than equity to finance the company.

DFL (EBT)B

Implications

A company that issues debt must produce sufficient operating income (EBIT) to cover its fixed interest costs. However, once fixed interest costs are covered, additional EBIT will go straight to net income and earnings per share. A higher degree of financial leverage implies that a relatively small change in earnings before interest and taxes (increase or decrease) will have a greater effect on profits and shareholder value. Another benefit of financial leverage is that interest costs are tax deductible, whereas dividends are not.

Companies that are highly leveraged may be at risk of bankruptcy if they are unable to make payments on their debt. They also may be unable to find new lenders in the future.

 $\frac{42}{21} = DFL$

If a firm with significant debt experiences a 42% increase in EPS as a result of a 21% increase in EBIT, the firm has more than enough operating income to cover its fixed interest costs. As a result, EPS has been magnified. If the firm had issued equity rather than debt, EPS most likely would have decreased because the number of shares outstanding would have increased. The higher a firm's financial leverage, the greater its potential profitability (but also the greater its risk).

DFL = 1A EBIT x 1 = A EPS

EXAMPLE

Jax Company issues new common equity to obtain cash for the purchase of new equipment for \$1,000,000. Jax is not using financial leverage, and has no fixed financing costs associated with this transaction. Jax may or may not pay dividends to the new stockholders.

Max Company borrows \$900,000 and uses its own cash of \$100,000 to buy equipment. Max is using financial leverage, and now must pay fixed interest costs annually.

A = L + E1,000 900 100

In the next year, the economy enters a recession, and profits do not materialize for Jax or Max as each had expected. Max must pay the fixed interest cost on the loan, which further erodes its already tight cash flow. Jax has no interest expense and protects its cash by not declaring a dividend.

In future years, as sales improve, Max Company will benefit from financial leverage because interest is a fixed charge and is tax deductible. Additional earnings in excess of the interest charges will go straight to EPS. Jax, however, has no such guarantee because dividends are not fixed and shareholders may require larger returns. In addition, Jax has more shares of stock outstanding, which dilutes EPS.

Δ EBIT × 10 = % Δ EPS

DOL × DFL = DTL % A EPS

THE WEIGHTED AVERAGE COST OF CAPITAL AND OPTIMAL CAPITAL STRUCTURE

WACCY = Firm value

* I. WEIGHTED AVERAGE COST OF CAPITAL = Value & ROIC > WACC

The weighted average cost of capital (WACC) serves as a major link between the long-term investment decisions associated with a corporation's capital structure and the wealth of a corporation's owners. The weighted average cost of capital is the average cost of all forms of financing used by a company. WACC is often used internally as a hurdle rate for capital investment decisions. The theoretical optimal capital structure is the mix of financing instruments that produces the lowest WACC

PASS KEY

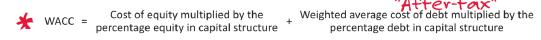
The value of a firm can be computed as the present value of the cash flow it produces, discounted by the costs of capital used to finance it. The mixture of debt and equity financing that produces the lowest WACC maximizes the value of the firm.

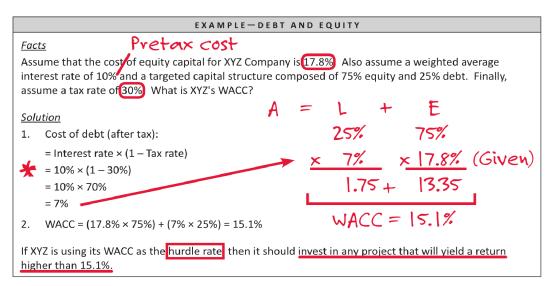
A. Computing the Weighted Average Cost of Capital (WACC)

The weighted average cost of capital (WACC) (s) the average cost of debt and equity financing associated with a firm's existing assets and operations.

1. Formula

The weighted average cost of capital structure. See the weighting the cost of each specific type of capital by its proportion to the firm's total capital structure.





2. Individual Capital Components

<u>Individual capital components include both long-term and short-term</u> elements of a firm's permanent financing mix.

- a. Long-Term Elements
 - Long-term elements include long-term debt, preferred stock, common stock, and retained earnings.
- retained earnings.

 b. Short-Term Elements

Short-term elements may include short-term interest-bearing debt (e.g., notes payable). Other forms of current liabilities (e.g., accounts payables and accruals) are rarely, if ever, included in the cost-of-capital estimate, because they generally represent interest-free capital.



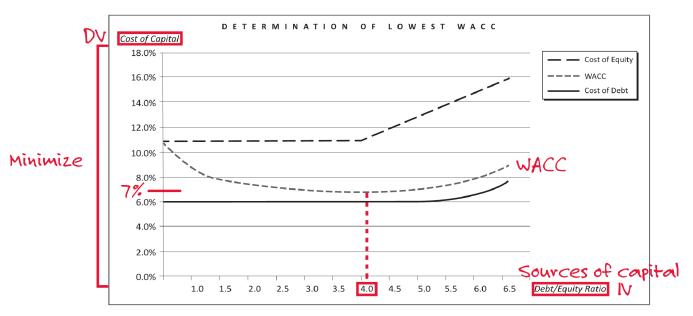
 \star c. After-Tax Cash Flows $\forall TM \times (1 - T) = After-tax cost debt "relevant"$

In evaluating the cost of the components of capital structure, *after-tax cash flows* are the most relevant. The cost of debt is computed on an after-tax basis because interest expense is tax deductible.

B. Optimal Capital Structure—Determination of the Lowest WACC to find + NPV projects

The optimal cost of capital is the ratio of debt to equity that produces the lowest WACCJRR > WACC Required rates of return demanded by debt and equity holders fluctuate as the ratio of debt to equity changes. At some point as debt to equity increases, leverage becomes more pronounced and debtors will demand a greater return for the high level of default risk. In addition, equity holders also will require a greater return due to the negative effect of high leverage on their potential future cash flows.

The following graph displays an example of the cost of using equity financing, the cost of using debt financing, and the resulting WACC as debt and equity conditions change. In this example, the firm achieves its lowest WACC when its debt-to-equity ratio is at 4.0.



Select ratio where WACC lowest

C. Application to Capital Budgeting

Generally, new projects are funded by sources of capital that maintain the optimum capital structure (ratio of debt to equity) and meet or exceed the hurdle rate implied by its cost. The historic weighted average cost of capital may not be appropriate for use as a discount rate for a new capital project unless the project carries the same risk as the corporation and results in identical leveraging characteristics. Appropriate application of the weighted average cost of capital as a hurdle rate for capital projects involves use of the weighted average cost of each additional new dollar of capital raised at the margin as that capital need arises.

II. COST OF CAPITAL COMPONENTS

The cost of capital is the cost of borrowing (interest rates on debt) and the cost of equity (return required by investors in exchange for assumed risk).

A. Weighted Average Cost of Debt "Pretax" - Step 1: Coupon = Par

The relevant cost of long-term debt is the after toy cost of

The relevant *cost of long-term debt* is the after-tax cost of raising long-term funds through borrowing. Sources of long-term debt generally include issuance of bonds or long-term loans. Debt costs are generally stated as the interest rate of the various debt instruments. In some cases, debt costs are stated according to basis points above U.S. Treasury bond rates (where 1 basis point is equal to one-hundredth of 1 percent, or 0.01 percent). The weighted average interest rate is calculated by dividing a company's total interest obligations on an annual basis by the debt cash available:



1. Pretax Cost of Debt

The *pretax cost of debt* represents the cost of debt before considering the tax shielding effects of the debt.

Step 2: 2. After-Tax Cost of Debt

Because interest on debt is tax deductible, the tax savings reduces the actual cost of debt. The formula for computing the after-tax cost of debt is:



EXAMPLE

Facts

Assume that the long-term debt component of the weighted average cost of capital for a firm includes a pretax cost of debt of 12.5% and a 30% tax rate. Compute the after-tax cost of long-term debt.

Solution

After-tax cost of long-term debt = Pretax cost of debt x (1 - Tax rate)

```
= 0.125 \times (1 - 0.30)= 0.125 \times 0.7= 0.0875
```

Although the pretax interest rate is 12.5%, the after-tax interest rate, after considering the deductibility of the interest expense, is 8.75%. Note that if the tax rate increased to 40%, the cost of debt would decrease to 7.5% [12.5% × (1 – 0.40)].

PASS KEY

- Debt carries the lowest cost of capital and is tax deductible.
- The higher the tax rate, the more incentive exists to use debt financing. Tax benefit

- Tax benefits
"high" if Th and
profitable

B3-25

B. Cost of Preferred Stock > cost debt < Ps assume more risk

The cost of preferred stock is the dividends paid to preferred stockholders. After-tax considerations are irrelevant with equity securities because dividends are not tax deductible.

1. Formula

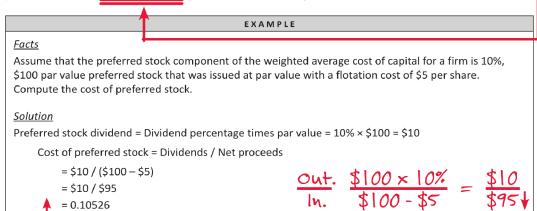


2. Preferred Stock Dividends

Preferred stock dividends can be stated as a dollar amount or a percentage. For example, 5 percent preferred stock pays an annual dividend of 5 percent of par value, if dividends are declared by the corporation.

3. Net Proceeds of Preferred Stocks

The net proceeds from a preferred stock issuance can be calculated as the gross proceeds net of <u>flotation costs</u> (i.e., issuance costs).



Common equity C. Cost of Retained Earnings > cost PE CS assume most risk

The cost of equity capital obtained through retained earnings is equal to the rate of return required by the firm's common stockholders. A firm should earn at least as much on any earnings retained and reinvested in the business as stockholders could have earned on alternative investments of equivalent risk. As mentioned above, after-tax considerations are irrelevant to equity securities because dividends are not tax deductible. Arriving at the components of the formula for the cost of retained earnings can be difficult and potentially subjective.

1. Three Common Methods of Computing the Cost of Retained Earnings

a. Capital asset pricing model (CAPM)

Memorize! b.

- b. Discounted cash flow (DCF)
- Bond yield plus risk premium (BYRP)

2. The Capital Asset Pricing Model (CAPM)

a. Key Assumptions

- (1) The cost of retained earnings is equal to the risk-free rate plus a risk premium.
- (2) The risk premium is equal to the <u>systematic (nondiversifiable)</u> risks associated with the overall stock market.

B>1 riskier B<1 less risky

- The beta coefficient is a numerical representation of the volatility (risk) of the stock relative to the volatility of the overall market. A beta equal to 1 means the stock is as volatile as the market, and a beta greater (less) than 1 means the stock is more (less) volatile than the market.
- The risk premium is the stock's beta coefficient multiplied by the market risk premium.
- The market risk premium is the market rate of return minus the risk-free rate.

Method | b. Cost of Retained Earnings Formula CAPM

Cost of retained earnings = Risk-free rate + Risk premium

= Risk-free rate + (Beta x Market risk premium)

= Risk-free rate + [Beta x (Market return – Risk-free rate)]



EXAMPLE

Facts

Assume that a firm's beta is 1.25 the risk-free rate is 8.75% and the market rate of return is

CAPM = RF + β (Mk+. - RF) | 4.25 - 8.75 = $\frac{8.75 + 1.25(14.25 - 8.75)}{14.25 - 8.75}$ Cost of retained earnings using the capital asset pricing model (CAPM).

Cost of retained earnings = Risk-free rate + Risk premium

$$5.5 \times 1.25 = 6.875$$

- $0.0875 + [1.25 \times (0.1425 0.0875)]$
- $0.0875 + [1.25 \times 0.0550]$
- 0.0875 + 0.06875
- 0.15625

Method 3. **Discounted Cash Flow (DCF)**

2

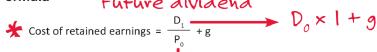
Key Assumptions

"Fairly priced"

- Stocks are normally in equilibrium relative to risk and return.
- The estimated expected rate of return will yield an estimated required rate (2)of return.
- The expected growth rate may be based on projections of past growth rates, a retention growth model, or analysts' forecasts.

b. **Formula**

Future dividend



Where:

Current market price

 $P_{_{0}}\;$ = Current market value or price of the outstanding common stock

 D_1 = The dividend per share expected at the end of one year

g = The constant rate of growth in dividends

Dividend yield + Growth

EXAMPLE

Facts

Assume that a firm is a constant growth firm that just paid an annual common stock dividend of \$2.00, has a dividend growth rate of 7.5% and a current market price for common stock of \$25.25 per share. Compute the cost of retained earnings using the discounted cash flow (DCF) method.

Compute the dividend per share expected at the end of the year as follows:

$$D_1 = D_0 \times (1 + g)$$

 $D_1 = $2.00 \times (1 + 0.075)]$

 $D_1 = 2.00×1.075

D, = \$2.15

Cost of Retained Earnings Using the Discounted Cash Flow (DCF) Method

Cost of Retained Earnings = $(D_1/P_0) + g$

= (\$2.15/\$25.25) + 0.075

= 0.0851 + 0.075

= 0.1601

 $\frac{\text{Div}_1 = \$2.15}{P_0 = \$25.25} + 7.5\% = |6.0|$ $\frac{(8.5)\%}{(8.5)}$

"Pretax"

Method 3 4. The Bond Yield Plus Risk Premium (BYRP)

Key Assumptions

- (1) Equity and debt security values are comparable before taxes.
- Risks are associated with both the individual firm and the state of the economy. Risk premiums depend on nondiversifiable risk.
- Risk estimation can be derived by using a market analysts' survey approach or by subtracting the yield on an average (A-rated) corporate long-term bond from an estimate of the market rate.

Formula b.



ormula

Reward for buying

Cost of retained earnings = Pretax cost of long-term debt + Market risk premium

Reward for buying viskiev CE

EXAMPLE

Facts

Assume that a firm has estimated its market risk premium at 4.5% and has determined that the yield to maturity on its own bonds is 11.34% Compute the cost of retained earnings using the bond yield plus risk premium (BYRP) method.

Cost of Retained Earnings Using the Bond Yield Plus Risk Premium Method

Cost of retained earnings = Firm's own bond yield + Market risk premium

- = 0.1134 + 0.045
- = 0.1584

5. Comparison of the CAPM, DCF, and BYRP Methods

- a. Each method is a valid method of calculating the cost of retained earnings.
- b. The average of the three cost amounts could be used as the estimate of the cost of retained earnings if there is sufficient consistency in the results of the three methods.

```
Facts

The cost of retained earnings under:

CAPM method = 15.625%

DCF method = 15.84%

Compute the average cost of retained earnings.

Solution

Average = \frac{(CAPM + DCF + BYRP)}{3}

= \frac{(15.625% + 16.01% + 15.84%)}{3}

= 15.825%
```

As asset TO \ ROA \ ASSET EFFECTIVENESS AND EFFICIENCY

RETURN ON INVESTMENT - Per 1/S and B/S (CF ignored) I.

Return on Investment Formula

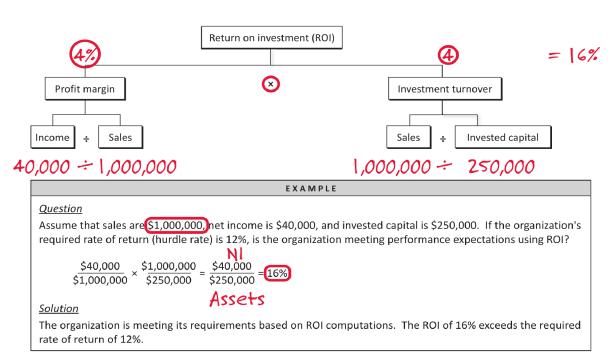
Return on investment (ROI) provides for the assessment of a company's percentage return relative to its capital investment risk. The ROI is an ideal performance measure for investment in strategic business units (SBUs). In simplest terms, ROI is expressed as income divided by invested capital; however, ROI is also expressed as a product of profit margin and investment turnover.



Definition and Interpretation

Return on investment (ROI) can be disaggregated as indicated in the flowchart (below), where income is expressed as a percentage of sales (i.e., the profit margin calculation) and sales are expressed as a percentage of invested capital (i.e., the investment turnover calculation). The higher the percentage return, the better.

ROI FLOW CHART



- Invest more in SBUs (products) with higher ROI (ROA)

C. Return on Assets

Return on assets (ROA) is similar to ROI, except that ROA uses average total assets in the denominator rather than invested capital.

$$\frac{NI}{D+E} = ROI$$

D. ROI/ROA Issues

1. Variations on Asset Valuation

Asset valuations used in the ROI and ROA computations affect the results. The appropriate asset valuation depends on the strategic objectives of the company and the direction that leadership wants to give its managers. The following terms define different asset valuations.

- a. Net Book Value Per GAAP old and/or MACRS = AD↑ = NBV ↓
 Assets valued at net book value represent historical cost less accumulated depreciation.
- b. Gross Book Value Ignores AD thus age and depr. method Assets valued at gross book value represent historical cost prior to the reduction for accumulated depreciation.
- c. Replacement Cost ≈ FMV GR: "highest"

Assets valued at replacement cost represent the cost to replace assets at their current level of utility.

d. Liquidation Value

Assets valued at liquidation value represent the selling price of productive assets.



PASS KEY

Adjustments to the ROI denominator raise the bar on asset, project or company performance. The higher the denominator used in the ROI computation, the lower the return.

2. Limitations of ROI - Residual income may be superior



ROI, like any performance measure, is designed to direct managers to achieve corporate objectives and provide a basis for incentives. ROI computations have limitations.

a. Short-Term Focus

Use of ROI exclusively as a measure of the performance can <u>inadvertently focus</u> managers purely on maximizing short-term returns.

(1) Investment Myopia

$$\frac{NI}{AV} = ROA$$

The <u>overemphasis of managers on investment balances</u> is referred to as investment myopia.

(2) Balanced Scorecard

Use of a balanced scorecard can focus managers on business process, customer, and human resource issues.

b. Disincentive to Invest

Profitable units are reluctant to invest in additional productive resources because their short-term result will be to reduce ROI.

Takes time for asset to produce sales

RETURN ON EQUITY AND THE DUPONT MODEL II.

Return on Equity - Stockholder perspective

"Required"

A critical measure for determining a company's effectiveness is its return on equity (ROE).

The advantage of this ROE formula is that it is simple to compute. However, additional breakouts of the components of ROE provide management with a much clearer picture of the efficiencies and leverage of a given company's operations.

DuPont Analysis

1. **Components of DuPont ROE**

The DuPont model breaks ROE into three distinct components: net profit margin, asset turnover, and financial leverage.

Net Profit Margin

Net profit margin is a measure of operating efficiency.

Net profit margin =
$$\frac{\text{Net income}}{\text{Sales}}$$

Asset Turnover

Asset turnover is a measure of the degree of efficiency with which a company is

appetite

Financial Leverage "Amplifies" both risk assumed and

Financial leverage measures the extent to which a company uses debt in its capital structure.

2. **Calculating DuPont ROE**

The formula for DuPont ROE is: Financial leverage Average total assets Equity

Note that net profit margin and asset turnover can be multiplied to calculate return on assets (ROA). Therefore, DuPont ROE can also be calculated as:

DuPont ROE = ROA x Financial leverage

Extended DuPont Model



The extended DuPont model further breaks out net profit margin into three distinct components: tax burden, interest burden, and the operating income margin.

Tax Burden

The *tax burden* is the extent to which a company retains profits after paying taxes.

Interest Burden

The interest burden reflects how much in pretax income a company retains after paying interest to debt holders.

$$\uparrow \text{Interest burden} =
\uparrow \frac{\text{Pretax income}}{\text{EBIT}} =
\begin{matrix}
EBIT - I
\end{matrix}$$

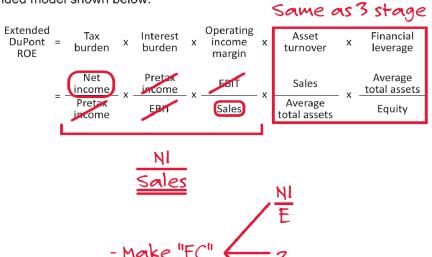
Operating Income Margin

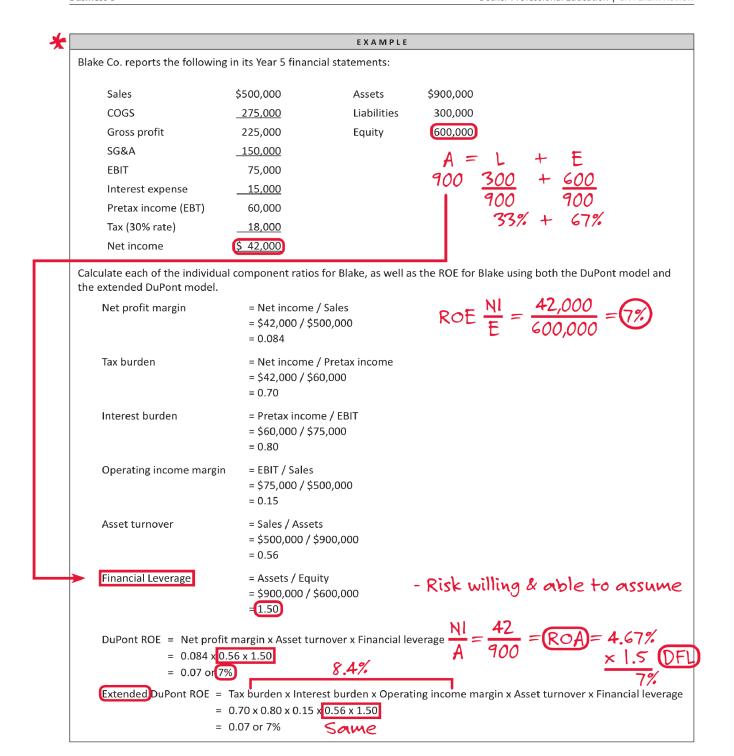
The operating income margin is a measure of company profits earned on sales after paying operating costs.

d. Extended DuPont ROE Formula (5)



The last two components of the ROE calculation remain the same, with the extended model shown below:





PASS KEY

It is important to note that both methods of calculating ROE (DuPont and extended DuPont) produce the same number. By breaking out the calculation into different components, however, <u>management can get a better understanding of what</u> factors are driving ROE and how those factors compare relative to competing companies and to the industry overall.



RESIDUAL INCOME AND ECONOMIC VALUE ADDED In dollars for investors III.

The residual income method measures the excess of actual income earned by an investment over the return required by the company. The rate of return/hurdle rate for the company may be its WACC, cost of equity, or it may simply be the return established by management as a target rate. Although ROI provides a percentage measurement, residual income provides an amount. Like ROI, residual income is a performance measure for investment SBUs.

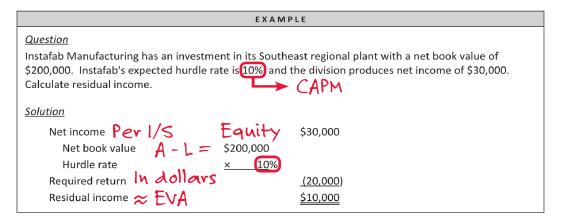
Computation and Interpretation

Formula

The formula for residual income is as follows: Focus on stockholders Profit available Residual income = Net income (from the income statement) - Required return In \$ on equity Where: Required return = Net book value Equity × Hurdle rate (after interest) $A - L = E \times \%$ - set by mgt. - <u>CAPM</u>

Interpretation 2.

A positive residual income indicates that performance is meeting standards, and a negative residual income indicates that performance is not meeting standards.



Residual Income Method Issues B.

Benefits of Residual Income Performance Measures

Advantages of using residual income include the ease of measurement of actual dollars earned by an investment above its required amount.

Realistic Target Rates In dollars

Usually, the target rate in the residual income method will be less than the highest return rates actually earned by the best-performing investment centers in a company. Historical weighted average cost of capital is often used as the target or hurdle rate; however, the rate optimally used is the target return set by the company's management.

Focus on Target Return and Amount In dollars b.



Residual income controls and performance measures encourage managers to invest in projects that generate income in excess of the target or calculated rate, thereby improving company profits and promoting the congruence of individual and corporate goals. Divisions with high rates of return do not fear dilution of their rates and, therefore, do not avoid investments that demonstrate strong residual income performance.

Weaknesses of Residual Income Performance Measures

Reduced Comparability

Use of an absolute amount to compute performance distorts comparison of units with unequal size. Larger units of an organization may produce larger dollar volumes of residual income even though their performance is identical to a smaller unit on a percentage basis.

Target Rates Require Judgment - Subjective = Residual income Reliance on computing a target rate of return may sometimes be difficult to establish.

"Is WACC" c. Economic Value Added Increase stock value/firm value

The Economic Value Added™ (EVA™) method of performance evaluation is very similar to the residual income method. The residual income method computes required return based on a hurdle rate determined by management, and the EVA measures the excess of income after taxes (not counting interest expense) earned by an investment over the return rate defined by the company's overall cost of capital WACC. The amount used to represent income after before int. taxes is the firm's net operating profit after taxes NOPAT, and it often incorporates several but after accounting adjustments prior to application into the model. Economic value added ensures that performance is measured in comparison to changes associated with all capital, debt, and equity. EVA is expressed as an amount and is considered a form of economic profit.

Formula EVA = NOPAT - SWACC

The steps for the formula for economic value added are as follows:

Step 1: Calculate the required amount of return and income after taxes.



Step 2: Compare income to the required return.

EBIT × (1 - T)

Interpretation

Positive EVA

Apositive EVA indicates that performance is meeting standards.

Negative EVA

Anegative EVA indicates that performance is not meeting standards. Stock

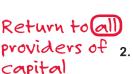
Economic Value Added Component Issues - More flexible than RI 3.

Economic value added can be refined using investment or income adjustments to produce a more accurate analysis of economic profit (value added).

- **Investment Valuation Issues**
 - (1) Capitalization of Research and Development Thus NI

The organization may capitalize research and development costs as part of its asset base along with other value-adding investments in advertising and training.

(2) Current Valuation of the Balance Sheet FMVA & Invested capital Balance sheet accounts are generally revalued to represent current cost.



Profit

b. Income Determination

Income may be adjusted to eliminate the effect of certain transactions and thereby create a nearly cash basis income statement.

- (1) Adjustments to the balance sheet affect the income statement.
- (2) Deferred taxes are ignored.



EXAMPLE

Question

Instafab Manufacturing has an investment in its Southeast regional plant with an investment of \$300,000 after adjustments for capitalization of research and development costs and revaluation of certain assets. The company's cost of capital is 12%, and its division produces a net operating profit after taxes of \$50,000 after adjustments for current-year research and development, asset revaluations, and other accounting considerations. Calculate the economic value added.

EVA is WACC

<u>Solution</u>

NOPAT
$$EBIT \times (I - T)$$
 \$50,000

Investment $D + E$ \$300,000

Cost of capital $WACC \times 12\%$

Required return In Aollars

Economic value added \$14,000 - In Aollars

Instafab's economic value added is positive. Instafab has added to shareholder value.

IV. EFFECTIVENESS OF LONG-TERM FINANCING - Capital structure

The evaluation of the effectiveness of long-term financing or solvency is typically associated with return on investment and residual income. Additional measures include debt to total capital, debt to equity, and debt to assets. The times interest earned ratio measures the company's ability to meet its interest obligations on long-term debt.

A. Debt-to-Total-Capital Ratio Measure of financial leverage - risk

1. Formula



$$A = L\uparrow + E \downarrow$$

$$\frac{Nl}{E \downarrow} = ROE \uparrow$$

2. Interpretation

The debt-to-total-capital ratio provides indications related to an organization's long-term debt-paying ability. The lower the ratio, the greater the level of solvency and the greater the presumed ability to pay debts. The debt-to-total-capital ratio is alternatively expressed as the debt-to-asset ratio (below).

$$\frac{D \downarrow}{Investment} = Risk \downarrow \qquad \frac{NI}{EA} = ROE \downarrow$$

Debt-to-Assets Ratio

Formula



$$\downarrow \text{ Debt-to-assets ratio} = \frac{\text{Total debt}}{\text{Total assets}} \qquad A = L + E \qquad \frac{\text{NI}}{\text{EA}} = \text{ROE} \downarrow$$

2. Interpretation

This ratio indicates long-term debt-paying ability. The lower the ratio, the better protection afforded to creditors.

Variations 3.

Some analysts adjust the debt-to-asset ratio to exclude certain items from the denominator (such as reserves, deferred taxes, minority shareholder interests, and redeemable preferred stock) as a basis for refining the amount truly available to liquidate debt.

C. Debt-to-Equity Ratio
$$1 + \frac{D}{E} = DFL$$
 DuPont $= \frac{A}{E}$

Although comprehensive ratios provide insights into the overall solvency, relationships between the elements of capital structure provide more refined views of solvency.

1. Formula
$$.50 \text{ Debt-to-equity ratio} = \frac{10}{\text{Total debt}}$$

$$1 + .50 = 1.5$$
2. Interpretation
$$A = L + E$$

$$30 \quad 10 + 20$$

$$A = \frac{10}{20} + \frac{10}{$$

2.

The debt-to-equity ratio relates the two major categories of capital structure to each other and indicates the degree of leverage used. The lower the ratio, the lower the risk involved.

3. Variations
$$ROA \times DFL = ROE$$

Some analysts use the reciprocal of this ratio (total shareholders' equity to total debt) to measure the amount of equity backing up every dollar of debt. Another alternative version of this ratio uses only long-term debt in the numerator to purely compare only the long-term elements of capital structure.

D. **Times Interest Earned Ratio**

The times interest earned ratio shows the number of times the interest charges are covered by net operating income.

Formula

Low

Risk

Times interest earned =
$$\frac{\text{Earnings before interest and taxes (EBIT)}}{\text{Interest expense}} \uparrow \text{Thus Aeb+} \Rightarrow \frac{\text{NI}}{\text{EA}} = \text{ROE} \downarrow$$

2. Interpretation

The times interest earned ratio measures the ability of the company to pay its interest charges as they come due. It is a measure of long-term solvency.

WORKING CAPITAL MANAGEMENT

Risk + return 1

I. **WORKING CAPITAL RATIOS**

Working capital policy and working capital management involve managing cash so that a company can meet its short-term obligations, and include all aspects of the administration of current assets (CA) and current liabilities (CL). The goal of working capital management is shareholder wealth maximization. The optimal mix of current assets and current liabilities depends on the nature of the business and the industry and requires offsetting the benefit of CA and CL against the probability of technical insolvency.

Definition of Net Working Capital = CA - CL

Net working capital is defined as the difference between current assets (CA) and current liabilities (CL). Risk + but return + liabilities (CL).

(Cash + MS↑

(Balancing) Profitability and Risk

B.

Working capital is expensive to carry because it must be financed either with long-term or short-term debt or with stockholders' equity. Adequate working capital reserves mitigate risk, potentially reduce returns, and thereby increase profitability.



1. **Current Ratio**

The net amount of working capital (CA minus CL) measures the amount by which current assets exceed current liabilities, and the current ratio (CA divided by CL) measures the number of times current assets exceed current liabilities and is a way of measuring short-term solvency. This ratio demonstrates a firm's ability to generate cash to meet its short-term obligations.

WICT More

Formula



Analysis

In general, a higher current ratio is better. The current ratio is generally considered to be the best single indicator of a company's ability to meet short-term obligations. The current ratio measures liquidity at a point in time, but it is not indicative of future cash flows.

In terms of risk \

WC \ **Deteriorating Current Ratio** Risk

Adecline in the current ratio, which implies a reduced ability to generate cash, can be attributable to increases in short-term debt, decreases in current assets, or a combination of both.

Improving Current Ratio Risk

An increase or improvement in the current ratio implies an increased ability to pay off current liabilities and may be attributable to using long-term borrowing to repay short-term debt (in cases in which a firm lacks cash to reduce current debts).

Quick (Acid Test) Ratio

Formula



Interpretation

The guick ratio is a more rigorous test of liquidity than the current ratio because inventory and prepaids are excluded from current assets. Inventory is the least liquid of current assets. The ability to meet current obligations without liquidating inventory is important.

Variations C.

Some analysts elect to include prepaid assets in the numerator of the quick ratio, but it is more conservative to exclude such items. The higher the quick ratio (or, acid test ratio), the better.

Limitations of the Current Ratio 3.

Unless short-term liquidity is a relevant issue, the current ratio is not necessarily the best measure of the health of a business.

EXAMPLE

A restaurant might have low CA (e.g., accounts receivable and inventory) relative to CL (e.g., accounts payable and payroll obligations), but might otherwise be healthy in terms of increasing cash flows, growing reputation, good location, and limited long-term debt obligations.

A bookstore might have a high CA (e.g., inventory) relative to CL (e.g., accounts payable), but might otherwise be unhealthy in terms of diminishing cash flows, poor location, and increased competition from Internet vendors.

4. **Working Capital and Risk**

- Less working capital increases risk by exposing a company to the likelihood of a possible failure to meet current obligations.
- b. Less working capital increases risk because it may reduce a firm's ability to obtain additional short-term financing.

II.

MANAGEMENT OF CASH AND CASH EQUIVALENTS Too much, ROAV

Factors influencing the levels of cash include the volume of collections and their timing, the volume of disbursements and their timing, and the degree to which idle cash is invested in marketable securities.

Businesses use various techniques to maximize cash balances including managing float, synchronizing cash inflows and outflows, speeding collections and deposits, and mitigating risks with overdraft systems or compensating balances.

Motives for Holding Cash

Companies hold cash to make routine payments for business transactions, to repay loans and other financing costs, to maintain compensating balances for banks, to prepare for future uncertainties, and to prepare for future opportunities. Motives for holding cash include:

Transaction Motive

A company may hold cash to meet payments arising from the ordinary course of business.

Speculative Motive

Cash may be needed to take advantage of temporary opportunities.

Precautionary Motive - Concern of treasurer - liquidity/safety 3.

It is important to have enough cash on hand to maintain a safety cushion to meet unexpected needs.

Disadvantages of High Cash Levels ROAV

Maintaining high levels of cash can be a disadvantage because of:

- The "negative arbitrage" effect (i.e., interest obligations exceed interest income from cash reserves).
- 2. Increased attractiveness as a takeover target.
- Investor dissatisfaction with allocation of assets (i.e., failure to pay dividends). 3.
- Primary Methods of Increasing Cash Levels (reducing the operating cycle) Sell & collect quickly
- * Either speeding up cash inflows or slowing down cash outflows increases cash balances. Improved rates of cash collection are generally achieved through faster accounts receivable collections. Reduced cash outflows are often achieved through delayed (or deferred) disbursements. The combination of current cash inflows and current cash outflows related to a business is called the operating cycle. The objective of financial managers is to shorten the operating cycle.
 - Methods to Speed Collections
 - **Customer Screening and Credit Policy**

A company can choose to extend credit to more responsible customers, who are more likely to pay bills promptly.

Prompt Billing b.

Timely billing of charges to credit customers ultimately serves to speed collections.

Payment Discounts

Cive to customers - "cost"

Rec. from vendor & do not take adv. - "opportunity" Offering payment discounts may influence customers to pay faster and can result in improved cash collections. Discounts forgone represent a higher cost to the customer than a bank loan for similar financing. The formula for calculating the annual cost (APR) of a quick payment discount follows:



APR of quick payment discount =
$$\frac{360}{\text{Pay period} - \text{Discount period}} \times \frac{\text{Discount}}{100 - \text{Discount} \%}$$

EXAMPLE

Facts

Terranova Company is considering offering quick payment discounts to customers in order to speed cash collections. Terms of the discount would be 1/10, net 30. Assuming a 360-day year, what would be Terranova's annual cost of credit for extending the discount if all customers took advantage of it?

Solution

$$\frac{360}{30-10} \times \frac{1\%}{100\%-1\%} = \frac{360}{20} \times \frac{1\%}{99\%} = 18.2\%$$
 Cost to firm "offer discount"

Note: Calculating the cost of quick payment discounts is a favorite CPA Exam exercise. Memorize this formula!

d. Expedite Deposits

Financial managers not only must collect credit sales in a timely manner, but also must ensure that funds are deposited and credited to their account quickly. The following techniques reduce the time during which payments received by a firm remain uncollected (not yet credited as cash in the bank).

(1) Electronic Funds Transfer

The electronic movement of funds from one institution to another is termed electronic funds transfer, or EFT. Electronic funds transfer and credit cards ensure timely payment.

(2) Lockbox Systems Good if additional interest income > bank Lockbox systems expedite cash inflows by having a bank receive payments from a company's customers directly via mailboxes to which the bank has access. Payments that arrive in these mailboxes are deposited into the

e. Concentration Banking

Concentration banking is characterized by the <u>designation of a single bank</u> as a central depository. Advantages of concentration banking include:

- (1) Improved controls over inflows and outflows of cash.
- (2) Reduced idle balances.
- (3) Improved effectiveness for investments.

company's account immediately.

See example page 46

f. Factoring Accounts Receivable - Good if benefit > cost

Factoring accounts receivable entails turning over the collection of accounts receivable to a third-party factor in exchange for a discounted short-term loan. Cash is collected from the factor immediately rather than from the customer according to the credit terms.

2. Methods to Delay Disbursements Thus cash balance

a. <u>Defer Payments</u> - Take full advantage of grace periods

Postponing payment of accounts payable provides a spontaneous source of credit to which management can resort if the company is confronted with a short-term cash shortage. Communications to creditors that payments will arrive later than usual serve to mitigate possible damage to credit ratings.

b. Drafts Don't pay cash

The <u>use of drafts or checks serves to delay cash disbursements.</u> Using drafts instead of checks increases the payable float.

of credit

VS. c. Line of Credit "Bank loan" - "safety"

Establishing a line of credit with a bank serves to slow down payments. A line of credit extends the company's trade credit by paying off the company's trade accounts with borrowed funds and allowing the company a longer period to pay back that loan to the bank.

Zero-Balance Accounts

An account that maintains a zero balance is termed a zero-balance account or ZBA. Zero-balance accounts are accompanied by a master (or parent) account that serves to fund any negative balance. Delegating account management work to the bank through zero-balance accounts helps to slow cash disbursements because a disbursement is made only when there is a demand for it (i.e., no float management).

EXAMPLE

A company wants to maximize its idle cash and sees its payroll float as an opportunity to capitalize on available resources. The company establishes its payroll account as a zero-balance account and links it to its operating account. The payroll account has a zero balance, but payroll checks are honored upon presentation by virtue of an automatic transfer arranged by the company to fund the checks presented to the zero-balance account. By eliminating the lump-sum transfer of payroll, the company is able to capitalize on the time its payroll transfer is available prior to employees cashing their checks.

3. **Other Cash Management Techniques**

Financial managers may use float, overdraft protection, or compensating balance measures as additional cash management techniques.

Managing Float Move cash earning interest in bank longer

Bank book Float occurs when there is a difference between the balance in a company's cash accounts and the balance in the bank's records. Proper management of the float allows firms to maintain a negative cash balance while showing a positive bank balance. Devices and procedures to manage float include wire transfers, zerobalance accounts, controlled disbursing, centralized processing of payables, and lock boxes.

Overdraft Protection Benefit > cost b.

Companies using float can provide some protections against overdrafts by arranging overdraft loans with the bank. These loans are usually activated only when an overdraft occurs and may be automatically repaid with the next deposit. The short outstanding loan time reduces interest costs.

Reduces \leftarrow c. fees - does not incr. cash

Compensating Balances Protects lender/bank

Minimum balances maintained at the bank in lieu of bank charges is referred to as a compensating balance. Amounts may serve to eliminate fees or to effectively collateralize credit lines or other loans.

D. **Cash Conversion Cycle**

The cash conversion cycle (sometimes called net operating cycle) is the length of time from the date of the initial expenditure for production to the date cash is collected from the customers and the vendors are paid for the initial expenditures.

The Cash Conversion Cycle Formula



 \oplus

* 2. Elements of the Cash Conversion Cycle Formula

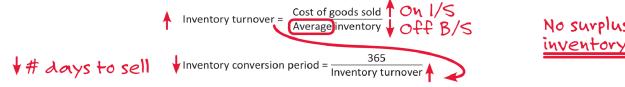
The elements of the cash conversion cycle can most easily be calculated using the related turnover ratios.

PASS KEY

The turnover ratios and the cash conversion cycle are commonly tested items. Make sure to learn these ratios.

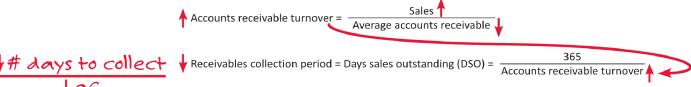
a. Inventory Conversion Period

The inventory turnover ratio (the number of times a year inventory is sold) and the inventory conversion period (the average number of days inventory is held before it is sold) are measures of the effectiveness of an entity's inventory management. The inventory conversion period measures the degree to which resources have been devoted to inventory to support sales. They are calculated as follows:



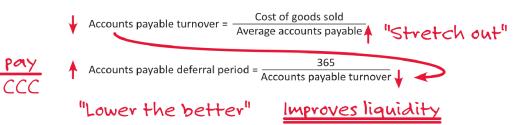
b. Receivables Collection Period

The accounts receivable turnover ratio and the receivables collection period are measures of the effectiveness of a company's credit policy. The accounts receivable turnover ratio measures the number of times receivables are collected over an accounting period (typically one year). The receivables collection period measures the number of days after a typical credit sale is made until the firm receives payment:



c. Payables Deferral Period - "Stretch out"

The accounts payable turnover ratio (the number of times a year a company pays its suppliers) and the accounts payable deferral period (the average number of days it takes for a company to pay its suppliers) are measures of the effectiveness of a company's attempt to delay payment to creditors.



"On own"

EXAMPLE—SYNCHRONIZING CASH INFLOWS AND OUTFLOWS

ABC Computers has annual sales of \$36 million. On average, the company carries \$5 million in inventory, \$3 million in accounts receivable, and \$3 million in accounts payable. If the annual cost of goods sold for ABC is \$27 million, what is the length of the cash conversion cycle for the firm?

Solution

Inventory conversion period:

Inventory turnover =
$$\frac{$27,000,000}{$5,000,000} = 5.4x$$

Inventory conversion period =
$$\frac{365}{5.4}$$
 = 67.6 days

Receivables collection period:

AR Turnover =
$$\frac{$36,000,000}{$3,000,000} = 12x$$

eivables collection period:

AR Turnover =
$$\frac{$36,000,000}{$3,000,000} = 12x$$

Receivables collection period = $\frac{365}{12} = 30.4 \text{ days}$

Payables deferral period:

AP Turnover =
$$\frac{\$27,000,000}{\$3,000,000} = 9x$$

Payables deferral period =
$$\frac{365}{9}$$
 = 40.6 days

Cash conversion cycle = 67.6 days + 30.4 days - 40.6 days = 57.4 days

III. MANAGEMENT OF ACCOUNTS RECEIVABLE

Accounts receivable management objectives include arriving at an appropriate balance between the accounts receivable balance outstanding and the amount of bad debts and converting accounts receivable into cash quickly enough to meet short-term obligations without angering customers.

Credit Policy If strict - # days to collect but # days to sell Goal -

Credit policy is one of the major determinants of demand for a firm's products or services, along with price, product quality, and advertising. The credit policy of a company is typically established by a committee of senior company executives. Credit policy variables include:

Credit Period

Credit period is the length of time buyers are given to pay for their purchases.

2. **Credit Standards**

Credit standards refer to the required financial strength of credit customers.

Collection Policy

Collection policy is measured by its stringency or laxity in collecting delinquent accounts.

4 4. **Discounts**

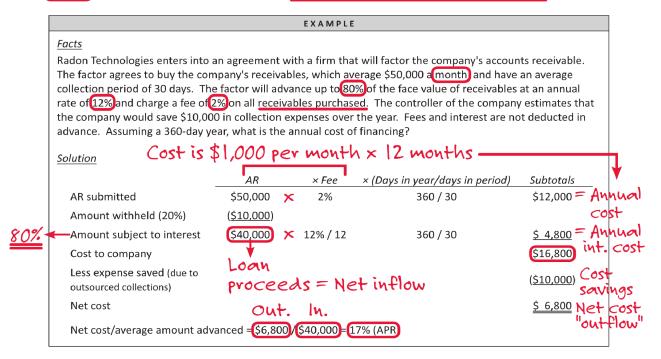
Discounts include the discount percentage and period.

lower

B. Factoring

But at what cost

Selling accounts receivable to a factor is a mechanism for speeding cash collections.



IV. MANAGEMENT OF ACCOUNTS PAYABLE) Defer w/out penalty

A. Trade Credit

1. Trade Credit

Trade credit (or accounts payable) generally provides the largest source of short-term credit for small firms. Trade credit represents the purchases of goods and services as part of usual and customary business transactions for which payment is made 30 to 45 days after acquisition.

* 2. Discounts - See ex. page 41 - opportunity cost

Although extension of payments under trade credit arrangements can be very effective in preserving cash balances and financing current operations, the effective annual interest cost can be extremely high if discounts are offered and forgone as part of this working capital management strategy.

B. Accruals

Accruals represent routine transactions that remain unpaid at the end of an accounting period (e.g., wages payable and taxes payable) purely as a result of transaction timing. Accruals are another common form of short-term credit.

V. MANAGEMENT OF INVENTORY

/Too little - lost sales - cost

Inventories represent the most significant current noncash resource of an organization. Inventories typically are most significant in businesses that involve the sale or manufacture of goods. Inventories may be classified as supplies, raw materials, work-in-process, and finished goods.

A. Factors Influencing Inventory Levels

Inventory depends on the accuracy of sales forecasts Lack of inventory can result in lost sales and excessive inventory can result in burdensome carrying costs, including:

- 1. Storage costs
- 2. Insurance costs
- 3. Opportunity costs of inventory investment
- 4. Lost inventory due to obsolescence or spoilage



PASS KEY

The lower the carrying costs of inventory, the more inventory companies are willing to carry.

B. Optimal Levels of Inventory

Numerous factors affect the optimal level of inventory, including the usage rate of inventory per period of time, cost per unit of inventory, cost of placing orders for inventory, and the time required to receive inventory. Significant concepts and calculations associated with inventory control and planning as well as inventory models and systems used in the determination of the optimal level of inventory include:

- Inventory turnover
- 2. Safety stock
- 3. Reorder point
- *
 - 4. Economic order quantity
 - 5. Materials requirements planning

C. Safety Stock

Many companies maintain safety stock to <u>ensure that manufacturing or customer supply</u> requirements are met. The determination of safety stock depends on the following factors:



- Reliability of sales forecasts
- 2. Possibility of customer dissatisfaction resulting from back orders
- 3. Cost of running out of inventory
- 4. Lead time (the time that elapses from the placement to the receipt of an order)
- 5. Seasonal demands on inventory

D. Reorder Point

The reorder point is the inventory level at which a company should order or manufacture additional inventory to meet demand and to avert incurring stockout costs. Stockout costs are incurred when customer orders cannot be fulfilled. Stockout costs include loss of income from product unavailability, the cost of restoring goodwill, and additional expenses incurred to expedite shipping. The reorder point can be calculated using the following formula:



Reorder point = Safety stock + (Lead time × Sales during lead time)



"<u>On own</u>"

EXAMPLE

Facts

Worldwide Widgets sells 8,000 widgets per year, manufactures widgets in groups of 1,500, and requires five weeks of lead time for widget production. Worldwide also maintains an absolute minimum safety stock of 1,200 widgets. Assuming a 50-week year and constant demand, what is Worldwide's reorder point for widgets?

Solution

Worldwide sells an average of 160 widgets per week (8,000 widgets per year / 50 weeks).

Reorder point = Safety stock + (Lead time x Sales during lead time)

Reorder point = 1,200 widgets + (5 weeks x 160 widgets per week) = 2,000 widgets

Worldwide will manufacture additional widgets when its inventory of widgets falls to 2,000 units.

E. Economic Order Quantity When I say two, you say "SOC"

When managing inventory, there is a trade-off between carrying costs (the costs of holding inventory) and ordering costs (the costs of ordering additional inventory). For example, if inventory levels are low, then carrying costs are low, but inventory must be ordered more frequently to meet demand, which increases ordering costs.

Ordering costs typically represent the costs of labor associated with order placement. The costs are driven by order frequency (rather than quantity per order) and they include the costs of entering the purchase order, processing the receipt of the inventory, inspecting the inventory to ensure that the goods received (typically a sample) are acceptable, and processing of the vendor invoice and consequent payment.

The economic order quantity EOQ inventory model attempts to minimize both ordering and carrying costs. The model can be applied to the management of any exchangeable good.

1. Assumptions

EOQ assumes that demand is known and is constant throughout the year, so EOQ does not consider stockout costs, nor does it account for costs of safety stock. EOQ also assumes that carrying costs and ordering costs are fixed.

2. The EOQ Equation and Equation Components



$$E = \sqrt{\frac{2SO}{C}}$$



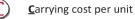
Order size (<u>E</u>OQ)



Annual Sales (in units)



Cost per Purchase Order (primarily production set-up costs)



2 Annual Gales x Order cost Oarrying cost per unit

EXAMPLE-EOQ

<u>Facts</u>

Maximus Company incurs carrying costs of \$50 a month and each order costs the firm \$5,625. If Maximus goes through 100 units of inventory monthly, what is Maximus' economic order quantity?

Solution

$$E = \sqrt{\frac{2SO}{C}}$$

▮

$$E = \sqrt{\frac{2 \times 100 \times \$5,625}{\$50}}$$

E = <u>150 units</u>

When Maximus orders inventory, it should order 150 units to minimize both ordering costs and carrying costs.

Note: Although the formula calls for annual sales and carrying costs, using monthly sales in the numerator and monthly carrying costs in the denominator will produce the same result.

F. Other Inventory Management Issues

1. Just-in-Time Inventory Models "Pull approach"

The *just-in-time (JIT) inventory model* was developed to reduce the lag time between inventory arrival and inventory use. JIT ties delivery of components to the speed of the assembly line. JIT reduces the need of manufacturers to carry large inventories, but requires a considerable degree of coordination between manufacturer and supplier.

2. Kanban Inventory Control

Kanban inventory control techniques give visual signals that a component required in production must be replenished. This technique prevents oversupply or interruption of the entire manufacturing process as the result of lacking a component.

3. Computerized Inventory Control

Computerized inventory control operates by establishing real-time communication links between the cashier and the stock room. Every purchase is recognized instantaneously by the inventory database, as is every product return. Computers are programmed to alert inventory managers as to reorder requirements. In some cases, company databases interface directly with supplier software to allow for instantaneous reorders, thereby removing the human element.

4. Materials Requirements Planning

Materials requirements planning (MRP) systems extend the idea of computerized inventory control to manufacturing operations. MRP systems are generally computer-based and are designed to control the use of raw materials in the production process.

vi. Management of Marketable securities If highly liquid - visk ♦ but veturn ♦

Marketable securities typically provide <u>much lower returns than operating assets but higher returns than cash</u>. Each security has its own features relating to safety, marketability, yield, maturity, and taxability.

A. Common Marketable Securities

Least risk

1. United States Treasury Bills or T-bills Proxy for CAPM "RF rate"

T-bills are sold with 28-day, 91-day, 182-day, and 364-day maturities and are backed by the U.S. government. T-bills are default risk-free, liquidity risk-free, and maturity risk-free; therefore, they are the safest securities on the market. T-bills set the base level interest rates in the U.S. economy.

2. Negotiable Certificates of Deposit CDs

Negotiable CDs are money market instruments that typically mature in one year or less and are issued in denominations of \$100,000 or more. As is true of all money market instruments that are relatively safe, there is an active secondary market for CDs on Wall Street. The guarantees of the largest commercial banks, FDIC regulations and insurance, and the secondary market keep CD risk and return at low levels. Bank failure and default are possible, and this slight additional risk gives CDs higher returns than T-bills.

3. Banker's Acceptances

Banker's acceptances are the <u>short-term IOUs of large</u>, <u>creditworthy corporations that are guaranteed by commercial banks</u>. The risks associated with banker's acceptances are only slightly higher than those of CDs, thus yields are only slightly higher.

4. Commercial Paper Notes/dvafts

Commercial paper refers to the short-term lending of idle cash from one creditworthy corporation to another. Commercial paper loans usually have terms of 90 to 180 days, and they usually are sold in denominations of \$100,000.

5. Equity Securities of Public Companies

Most visk Investment of idle cash in stocks is risky because of the volatility of the stock market. Gains are potentially far greater than yields from other marketable securities, but losses are also more likely.

6. Eurodollars

Eurodollars represent <u>United States dollars that are deposited in banks outside the United States</u> and are free from U.S. banking regulations. Often, Eurodollar investments are simply time deposits.

B. Factors Influencing the Level of Marketable Securities

In many cases, companies hold marketable securities for the same reasons they hold cash—most marketable securities can be converted to cash on short notice. Because marketable securities yield higher returns than cash, many firms will hold marketable securities in lieu of large cash balances.

1. **Liquidity**

When cash outflows exceed inflows, companies can liquidate marketable securities to increase the cash account.

2. Credit Hedge

In most cases, however, marketable securities are held primarily as a <u>precaution against</u> a possible shortage of bank credit in times of cash need.

C. Strategies for Holding Marketable Securities

1. Periods of Low Rates

If interest rates for marketable securities are low, and if the time required to liquidate these securities is substantial, then <u>cash holdings</u> are preferable to marketable securities.

2. Periods of High Rates

If interest rates for marketable securities are high, and if the time required to liquidate these securities is minimal, then <u>marketable securities</u> are <u>advisable</u>.

APPENDIX:

Summary of Formulae and Ratios

Various formulae and ratios are tested on the BEC exam. This list is provided as a convenient reference for the most common ones.

Ratio questions on the BEC exam may require a simple ratio calculation, an interpretation of what the ratio means, or an analysis of the effects of a change. Sometimes, when both the numerator and denominator are affected by a given change, the final result (increase or decrease) is not easy to determine. The best way to answer questions such as these is to make up numbers and plug them into the ratio formula. Listed below are some helpful ratios for the BEC Exam.

Cost of retained earnings—Method 1: Capital asset pricing model (CAPM)

Risk-free rate + Risk premium

= Risk-free rate + (Beta x Market risk premium)

= Risk-free rate + [(Beta x (Market return – Risk-free rate)]

Cost of retained earnings—Method 2: Discounted cash flow (DCF)

$$= \frac{D_1}{P_1} + g$$

Where:

P_o = Current market value or price of the outstanding common stock

D₁ = The dividend per share expected at the end of one year

g = The constant rate of growth in dividends

Cost of retained earnings—Method 3: Bond yield plus risk premium (BYRP)

Pretax cost of long-term debt + Market risk premium

Current ratio (working capital ratio)

Days cost of sales in inventory* = $\frac{7}{600}$

Average inventory

Cost of goods sold / 365

* Same as inventory conversion period

Days sales outstanding*

Average net receivables

Net credit sales / 365

* Same as accounts receivable collection period

Dobt to aquity ratio

Debt-to-equity ratio = Common stockholders' equity

Debt-to-assets ratio = $\frac{\text{Total liabilities}}{\text{Total assets}}$

Debt-to-total-capital ratio = $\frac{\text{Total debt}}{\text{Debt + Equity}}$

Depreciation tax shield = Depreciation x Tax rate

DuPont return on assets (ROA) = Net profit margin x Total asset turnover

DuPont return on equity (ROE) = Net profit margin x Asset turnover x Financial leverage

= ROA x Financial leverage

= Net income Sales x Sales Average total assets x Average total assets Equity

Extended DuPont ROE =
$$\frac{\text{Tax}}{\text{burden}}$$
 x $\frac{\text{Interest}}{\text{burden}}$ x $\frac{\text{Operating}}{\text{income}}$ x $\frac{\text{Asset}}{\text{turnover}}$ x $\frac{\text{Financial leverage}}{\text{leverage}}$ = $\frac{\text{Net income}}{\text{Pretax income}}$ x $\frac{\text{Pretax income}}{\text{EBIT}}$ x $\frac{\text{EBIT}}{\text{Sales}}$ x $\frac{\text{Sales}}{\text{Avg. total assets}}$ x $\frac{\text{Avg. total assets}}{\text{Equity}}$

Economic order quantity = $E = \sqrt{\frac{2SC}{C}}$

Where:

S = Annual sales in units

O = Cost per purchase order

C = Carrying cost per unit

Economic value added = Net operating profit after taxes (NOPAT) – Required return

Where:

Required return = Investment x WACC

Financial leverage =
$$\frac{\text{Average total assets}}{\text{Equity}}$$

Inventory conversion period* = $\frac{365}{\text{Inventory turnover}}$

* Same as days cost of sales in inventory

Inventory turnover = $\frac{\text{Cost of goods sold}}{\text{Average inventory}}$

Net present value = PV cash inflows - PV cash outflows

Net profit margin =
$$\frac{\text{Net income}}{\text{Net sales}}$$

Operating cash flow to total debt =
$$\frac{\text{Operating cash flow}}{\text{Total debt}}$$

Operating cycle = Accounts receivable turnover in days + Inventory turnover in days

Payback period (even cash flows) =
$$\frac{\text{Net initial investment}}{\text{Increase in annual net after-tax cash flow}}$$

Present value of a lump sum =
$$\frac{\text{Future value}}{(1 + \text{Interest rate})^n}$$

Where n = Number of years

Present value of an ordinary annuity = Payment x
$$\frac{1 - \left[\frac{1}{(1 + \text{Interest rate})^n} \right]}{\text{Interest rate}}$$

Where:

Required return = Net book value x Hurdle rate

Business 3

Return on equity (ROE) = $\frac{\text{Net income}}{\text{Total equity}}$

Return on investment (ROI) = $\frac{Income}{Investment capital}$

= Profit margin x Investment turnover

Where:

Profit margin = $\frac{Income}{Sales}$

 $Investment turnover = \frac{Sales}{Invested capital}$

Return on assets (ROA) = $\frac{\text{Net income}}{\text{Average total assets}}$

Times interest earned = Earnings before interest and taxes (EBIT)
Interest expense

Total asset turnover = Net sales

Average total assets

Weighted average interest rate (cost of debt) = $\frac{\text{Effective annual interest payments}}{\text{Debt cash available}}$

Working capital = Current assets – Current liabilities

Working capital turnover = $\frac{\text{Sales}}{\text{Average working capital}}$

BUSINESS 4

Information Systems and Communications

1.	Organizational needs assessment	3
2.	Systems design and other elements	20
3.	Security	34
4.	The Internet: Implications for business	40
5.	Types of information systems and technology risks	52
6.	Disaster recovery and business continuity	57
7.	Appendix: IT fundamentals	60
8.	Class questions	75

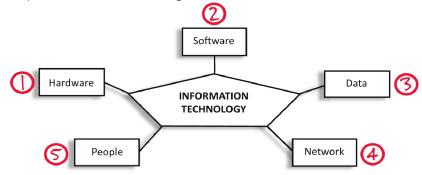
NOTES

ORGANIZATIONAL NEEDS ASSESSMENT

I. INTRODUCTION TO INFORMATION SYSTEMS AND COMMUNICATIONS

A. Information Technology

The phrase information technology (IT) is a general term that encompasses many different computer-related components. This section will cover the most important of these information technology components, as seen in the figure below.



One of the most basic and vital information technology components of any business is the set of software referred to as the "business information system." Business information systems can be divided into the categories of transaction processing systems, enterprise resource planning systems, decision support systems (also known as business intelligence systems), and executive information systems. These categories are not mutually exclusive; many business information systems perform multiple functions and can fit into several of these categories.

B. Components of Information Technology

Information technology generally consists of five components:

1. Hardware

Hardware is the <u>actual physical computer or computer peripheral device</u>. For example, a PC or some other kind of workstation, a mainframe, a disk drive, a tape drive, a monitor, a mouse, a printer, a scanner, and a keyboard are all considered hardware.

2. Software

Software includes the systems and programs that process data and turn that data into information. Software can be for general use by a wide range of organizations (e.g., a word processing program such as Microsoft Word®). It also can be for specialized purposes (e.g., an internal auditing program). Software can be developed internally by the organization or can be purchased as an application package from an outside vendor. It can be divided into the categories of system software, programming languages, and application software.

3. Network

A *network* is made up of the <u>communication media that allows multiple computers</u> to share data and information. Many different types of media allow computers to be connected (e.g., traditional twisted pair networking cables and coaxial cables). More recent technology allows computers to be connected with fiber optic cable, microwaves, wireless cellular, and even satellites.

4. People - IT dept. roles - pg. 31

Many different *people* are associated with business information systems. Note that <u>job</u> <u>titles</u> can vary widely among organizations, but the functions are somewhat standard given a particular hardware, software, and network configuration. Regardless of the titles involved, there are always the functions of initial setup and maintenance/support after initial setup. It is possible that people outside the organization may perform certain functions (i.e., those <u>functions</u> may be <u>outsourced</u> to other organizations).

5. Data/Information

LADP

a. Data

Data is raw facts (e.g., a quantity, a name, or a dollar amount). In a computer environment, data stored on devices is often described either as production data (data that results from production processing and is stored in production systems) or test data (data that results from test processing and is stored in test systems). Production and test data should be separately stored and accessed.

o. Information

-Staging/fake

Information is created from <u>data that have been processed and organized</u>. Information is useful for decision making whereas data are facts that are stored.

C. Roles of Business Information Systems

1. Four Primary Roles in Business Operations

A business information system has four primary roles in business operations:

- a. To process detailed data (such as transaction data) TPS
- b. To provide information used for making daily decisions Tactical DSS
- c. To provide information used for developing business strategies Strategic EIS
- d. To take orders from customers

2. Hierarchy of Roles - Different users have different responsibilities

The enterprise information system should be able to capture and process detailed transactional data as well as provide higher level aggregated data for management decision making. An integrated system allows for less redundancy of data entry and storage. Data is entered and made available to users who have need of that information, allowing a single system or network to serve the needs of lower-level users who need detailed transaction information as well as higher-level users who require aggregated information. Many systems allow higher-level users to drill down into the details of an item to review the data from which it was derived.

3. Functional Perspective

From a functional perspective, business information systems might be divided into:

- sales and marketing systems;
- b. manufacturing and production systems;
- c. finance and accounting systems; and
- d. human resources systems.

Systems may be developed for a particular part of a business or a specific department or may perform an entire business process cutting across different parts of the business. Other systems, such as customer relationship management systems and supply chain management systems, may reach outside the business to customers and to vendors.

II. DATA CAPTURE

The first step in processing business transactions is to capture the data for each transaction that takes place and enter the data into the system.

A. Business Events

The data capture process is usually triggered by the occurrence of a business event or transaction. Relevant data must be captured for each event. In a manual system, a source document (e.g., invoice, purchase order) is created. In a computerized system, this information is often entered directly into the system.

EXAMPLE

A common transaction within the revenue cycle is a sale. For each sale, an organization collects data such as the date and time of the sale, the employee who made the sale, the checkout clerk who processed the sale, the checkout register where the sale was processed, the item(s) sold, etc.

B. Data Capture Techniques

Data about business activities is often captured directly through computer data entry screens.

1. Manual Entries

Data may be physically input by individuals. The <u>data entry screen often retains the</u> same name and layout as the paper source document it replaced (e.g., the cash receipts screen).

2. Source Data Automation

Source data automation devices capture transaction data in machine-readable form at the time and place of their origin (e.g., ATMs used by banks, point-of-sale [POS] scanners used in retail stores, and bar code scanners used in warehouses). Banks have even begun accepting photos of source documents such as checks so that the depositor need not even deliver the physical check to the bank.

C. Data Accuracy

It is important to ensure that captured data are accurate and complete. Several techniques can help ensure that data are captured accurately and completely.

1. Well-Designed Input Screens

Well-designed data entry screens request all required data and guide the data entry person in entering correct data. Validation rules and clear messages for errors ensure that data meet required parameters. For some fields, such as state abbreviations, drop-down lists ensure consistency in the data. Input masks for phone numbers, Social Security numbers, and credit card numbers help the data entry person to more easily review the entry for correctness. Source data automation captures data automatically and can thereby avoid some common data entry errors.

2. Auto-Entry fields

The use of preprinted or prenumbered source documents and automatic system assignment of sequential numbers prevents duplication of document numbers or skipping numbers. Auto-numbering can ensure that all transactions have been recorded and that none of the documents has been misplaced. Other auto entry fields that may be used include date and time stamps.

III. PROCESSING

Once data about a business activity has been collected and entered into the system, the data must be processed.

A. Functions Performed on Data

Business information systems allow a business to perform the following functions on data:

- 1. Collect
- 2. Process
- 3. Store
- Transform
- 5. / Distribute

EXAMPLE

For example, an order entry system might:

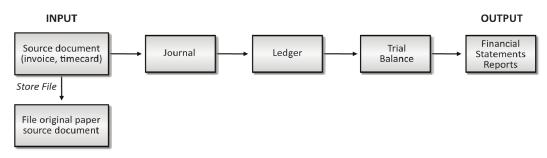
- Allow the entry or collection of the details of an order
- Store the order as order information and customer information
- Process the order by applying the appropriate prices and discounts
- Transform the order into separate transactions for the warehouse to pull and ship the inventory that was ordered and ensure that the accounting system makes the appropriate journal entries to record the sale
- Distribute (transmit) the transactions that resulted from the order to the warehouse in the form of a pick list with shipping information and to the accounting system in the form of debits and credits

B. Normal Series of Events in a Business Information System

After a business information system is <u>set up and configured by hardware technicians</u>, <u>network administrators</u>, <u>and software developers</u>, the <u>system is considered functional</u>. Once the system is fully functional, a <u>person</u> (generally an end user) inputs data. After the data is collected, stored, and processed, the <u>information output can be shared across a network with</u> other end users.

C. Accounting Information Systems (A/S)

The business information system that is most important to an accountant is the accounting information system (AIS). An accounting information system is a type of management information system; it may also be partly a transaction processing system and partly a knowledge system. There may be separate systems (often called modules) for each accounting function such as accounts receivable, accounts payable, etc., or there may be one integrated system that performs all of the accounting functions, culminating in the general ledger and the various accounting reports. A well-designed AIS creates an audit trail for accounting transactions. The audit trail allows a user to trace a transaction from a source document to the ledger and to trace from the ledger back to the source documents. The ability to trace in both directions is important in auditing. An example of a basic accounting audit trail is as follows:



1. Objectives of an AIS

The objectives of an AIS are to:

- a. record valid transactions;
- b. properly classify those transactions;
- c. record the transactions at their proper value
- d. record the transactions in the proper accounting period; and
- e. properly present the transactions and related information in the financial statements of the organization.

2. Sequence of Events in an AIS

The sequence of events in an AIS is as follows:

- a. The transaction data from paper source documents is entered into the AIS by an end user. Alternatively, there may be no paper source documents if, for example, an order is entered through the Internet by a customer or if other source data automation is used.
- b. The original paper source documents, if they exist, are filed.
- c. The transactions are recorded in the appropriate journal.
- d. The transactions are posted to the general and subsidiary ledgers.
- e. Trial balances are prepared.
- f. Adjustments, accruals, and corrections are entered.
- g. Financial reports are generated.

3. Transaction Cycles

The individual transactions of a business are typically processed and controlled through an AIS that is customized to the requirements of a specific business. Similar economic events are typically grouped for repetitive processing into five transaction cycles. Individual industries might have additional or customized transaction cycles.

a. Revenue Cycle

Transactions associated with the <u>sales of goods or services that produce cash</u> <u>or other assets</u> (e.g., receivables). Modules may interface with other cycles but often include:

- (1) Customer orders and credit verification
- (2) Accounts receivable
- (3) Cash receipts

b. **Expenditure Cycle**

Transactions associated with <u>purchase of goods or services that use cash or produce debt or other obligations</u>. Modules may interface with other cycles but often include:

- (1) Purchasing
- (2) <u>Inventory control</u> (work in process)
- (3) Accounts payable
- (4) Cash disbursements

c. **Production Cycle**

Transactions associated with the <u>conversion of resources</u> (e.g., raw material or time) <u>into products or services</u>. Modules may interface with other cycles but often include:

- (1) Product design and production planning
- (2) Product manufacturing
- (3) Inventory control (finished goods)

d. Human Resources/Payroll Cycle

Transactions associated with all phases of employee administration (hiring, determining compensation, paying employees, benefits administration and termination). Modules may interface with other cycles but often include:

- (1) Human resources (hire, evaluate, administer benefits, etc.)
- (2) Time and attendance
- (3) Payroll disbursements
- (4) Payroll tax reporting

e. Financing Cycle

Transactions associated with <u>equity and debt financing including issuance of stock</u> or debt, payment of dividends or debt service payments, etc.

D. Data Processing Cycle

Transaction processes are generally divided into the following four functional areas that make up the data processing cycle.

1. Data Input

Transactions must be captured or gathered and entered into a system.

a. Basic Issues Associated With Data Input

- (1) All transactions of interest are accounted for.
- (2) All transactions are completely accounted for in the correct accounts.
- (3) All the people originating the transactions are identified.

b. <u>Input Verification</u>

Tracing the data to appropriate supporting evidence contributes to validation of the accuracy of the transaction and its authorization.

(1) Source Documents

Purchase orders, customer orders, and time sheets are examples of source documents used in data input. Documents may be either manual or computer generated.

(2) Turnaround Documents

Turnaround documents preprint data in machine-readable form. The document is sent to the customer along with the invoice or statement. When the customer remits payment, the turnaround document (sometimes called a remittance advice) is included. The turnaround document is machine readable and helps ensure that the correct account is credited with the payment.

c. Features of Desirable Data Input Procedures

- Prenumbered source documents allow for verification of completeness of data input.
- (2) Source documents are efficiently designed to capture all required information.
- (3) Data input is verified prior to acceptance by the system (e.g., the reasonableness of hours worked, the availability of inventory to ship, etc.).

2. Data Storage

Data storage includes the following methods and media used for keeping data available for retrieval.

a. Methods

(1) **Journals and Ledgers**

Generally speaking, data is entered into an AIS first to journals (for individual transactions) and summarized (by account groups) into ledgers. Audit trails allow for summary ledger data to be traced to journals and then to specific transactions and source documents.

(2) Coding

Coding is used to make data in the AIS more accessible and useful. Several different types of coding methods exist:

(a) Sequence Codes

Sequence codes are generally used to ensure that all transactions or documents are accounted for. A list of transactions should include neither duplicates nor gaps in the number sequence. Common uses are check numbers, invoice numbers, transaction numbers, etc.

(b) Block Codes

Block codes use blocks of numbers to group similar items. For example, in the chart of accounts, assets might be coded 100–199 while liabilities are 200–299, etc. Inventory items might have bicycles coded as 80–89, and kayaks as 30–39. The use of block codes makes finding relevant accounts easier and can help minimize errors in data entry.

(c) Group Codes



Group codes have additional information over block codes. Within the account or item number, different groups of numbers have meaning. For example, a phone number includes the area code as the first three digits and the exchange code as the next three. This system can be used in a chart of accounts to identify assets as the block from 1000–1999. The "1" indicates assets. The next number could be used to indicate current or long-term assets. For inventory, the first two digits might indicate whether the item is an appliance, the next digits might indicate whether the item is a kitchen appliance or laundry, etc.

(3) Charts of Accounts

Charts of accounts represent a form of coding that summarizes accounting data by ledger classification (e.g., assets, liabilities, revenues, expenses, etc.) for purposes of financial analysis and presentation. The chart of accounts allows the business to customize classification of data in the ways that best meet the information requirements of the business. The chart of accounts can include coding that allows reports to be created by division, by segment, by geographic location, etc. It is important to consider reporting when designing the chart of accounts, because the desired reporting segments must be identified in the coding scheme or it may become difficult to create reports using those segments.

EXAMPLE

A sample general ledger code from a large company is 102066-60235.

102066 is a "location code," representing the West region (10), the state of Arizona (20), and District 66. 60235 is an operating expense account (60) for salaries (2) for the administrative staff (35) of the district.

b. Computer Storage

Computer storage of data should follow a logical sequence. That sequence includes the following definitions:

(1) Entity

The subject of the stored information (e.g., employee, customer, etc.).

(2) Attributes

The <u>specific items of interest for each entity</u> (e.g., rate of pay for employees, credit rating for customers, etc.).

(3) Field

A field contains a single piece of information (an attribute) of the entity. Examples would be FirstName, LastName, City, State, etc.) Each field should contain a single piece of data (rather than having a single field that includes first and last names) so that the data can be efficiently searched and sorted.

(4) Record

A record includes <u>all attributes about a single instance of an entity</u> (e.g., an employee). A record might consist of FirstName, LastName, City, State and ZipCode.

(5) Data Value

The contents of fields are typically referred to as data values.

(6) File

Records are grouped into files.

(7) Master file

<u>Similar to a ledger</u>, the master file stores cumulative information and information that is relatively permanent (e.g., customers, vendors, inventory).

(8) Transaction File

Similar to a journal, the transaction file stores individual transactions.

(9) Database

Files that are interrelated and coordinated are referred to as a database.

EXAMPLE

Brown and Co.'s master file includes the name, address, account number, etc. of the customers. A transaction file includes sales transactions with the customers for a given month. Both files contain the customer number. A database uses the common field (customer number) to relate the customer name and address to transaction data, which facilitates the creation of a report of all sales for a particular customer for the month.

3. Data Processing

Transactions are processed to keep information current, and include various functions and methods described below:

a. Functions What is done to the database

Data processing functions are listed logically, but not necessarily sequentially.

(1) Addition

Addition is the process of <u>adding new records to the database</u>. Examples include adding a new employee, creating a new inventory item, etc.

(2) **Updating**

Updating includes revisions to a master file, such as changes in cumulative year-to-date payroll each payday, changes in employee status, changes in pay rate, etc. These are changes to fields in existing records as opposed to adding new records.

(3) **Deletion**

Deletion is the removal of records from the database. Examples include deletion of employees who are no longer with the company or inventory items that are no longer stocked. Users must be careful when deleting records because there may be history associated with the items that would be deleted along with the record.

b. Methods How is it done to the database

(1) Batch Processing

Batch processing occurs when transactions are recorded but <u>master files</u> are only updated periodically, such as daily. Data entry may be online but processing of transactions can be performed in batches.

(2) Online Real-Time Processing OLRT

Real-time processing occurs when transactions are recorded and <u>master files</u> are immediately updated in real-time.

4. Information Output

Transactions are processed and may be summarized and used to produce outputs. Many different types of outputs exist.

a. Form

(1) **Documents**

Documents (sometimes referred to as operational documents) include outputs such as checks, purchase orders, receipts, etc.

(2) Reports

Reports can be either internal (e.g., sales analysis) or external (e.g., financial statements). Information is produced periodically to satisfy the needs of specific audiences. Reports are static and must be reevaluated for relevance from time to time. Reports will usually include summarized information or data that has been sorted or grouped to meet specific user information needs.

(3) Query

A query is a request for specific data (e.g., day's sales). The user enters the query and the system produces a response according to parameters specified by the user. Queries can be designed and saved to produce reports that users need on a regular basis.

b. Topic

Report topics can cover many purposes. Some common types of reports generated by AIS include:

- (1) Budgets
- (2) Production and delivery schedules
- (3) Performance reports

E. Processing Methodology

In a computerized environment, there are two methods of performing file maintenance on master files, including databases.

1. Batch Processing

Into batches

With *batch processing*, input documents/transactions are collected and grouped by type of transaction. These groups (called batches) are processed periodically (e.g., daily, weekly, monthly, etc.). Batch processing systems may use either sequential storage devices (i.e., magnetic tape) or random access storage devices (i.e., disks).

Sometimes, input transactions may be entered and verified online, but the processing of those transactions and the updating of the appropriate master files may be done with batch processing.

a. Always a Time Delay

With batch processing, there is always a time delay between the time the transaction is initiated and the time that it is fully processed. Thus, the accounting or other master files are not always current and some error detection may be delayed.

b. Steps in Batch Processing

Batch processing is accomplished in the following two steps:

(1) Create a Transaction File - Batch

The first step in batch processing is to create a transaction file by entering the data, editing the data for completeness and accuracy, and making any necessary corrections. The process of editing and correcting the data is known as an edit process or data validation.

(2) Update the Master File

The second step in batch processing is to update the master file (or files) by sorting the transaction files into the same order as the master file and then updating the relevant records in the master file from the transaction files. If the master files are stored on random access devices, the sorting is not necessary but will result in more efficient processing.

c. Compare Manual and Computer-Generated Batch Control Totals

Batch - \$ Hash - other f With batch processing, a <u>batch total for a transaction file is manually calculated</u> and then compared, either manually or in an automated manner, to a computer-generated batch control total. Any difference between the two totals indicates an error in accuracy, completeness, or both. The term "batch total" is most often used for totals of *dollar fields* (a batch might contain \$1,000,000 of debits and \$1,000,000 of credits). When the item totaled is not dollars, it is called a hash total. A *hash total* might be, for example, a total of the various customer numbers in a batch; it is meaningless other than for checking during the various parts of the processing of the batch. The hash total can be used to ensure that documents are not switched. For example, an invoice for one vendor is switched with an invoice to be paid to a different vendor. *Document counts* can be used in the same manner.

d. Often Used in Traditional Systems

Batch processing is most often found in "traditional" systems, such as payroll or general ledger systems, where the data in the system does not need to be current at all times. System-to-system transfers of data or extracts and transfers of data to update separate data warehouses may also be done in batch.

2. Online, Real-Time (OLRT) Processing

With *OLRT processing*, the <u>master files are updated as the transactions are entered</u>. Unlike batch systems, OLRT systems <u>require random access storage devices</u>. OLRT processing is often simply called online processing. Keep in mind that online data capture does not require real-time processing.

EXAMPLE

Branch personnel in 50 states may enter journal entries online to a corporate accounting system. Afterward, the general ledger may be updated on a weekly basis via batch processing. Under this model, the general ledger would be current once per week.

A ticket reservations system is an example of an OLRT processing system.

a. Immediate Processing (no delay)

OLRT processing is an immediate processing method in which each transaction goes through all processing steps (data entry, data validation, and master file update) before the next transaction is processed. OLRT files are always current and error detection is immediate.

OLRT systems are used whenever it is critical to have current information available or when individual accounts need to be accessed in a random order (e.g., accounts receivable balances or perpetual inventory records associated with a point-of-sale system).

b. OLRT Often Used in Networked Systems

Because transactions are processed as they occur, OLRT systems generally require the use of a computer network to permit data entered at many locations to update a common set of master files.

c. Point-of-Sale (POS) Systems

POS systems use scanners to capture data encoded on product bar codes and then transmit that data over a LAN or other network to a central database. A POS system is generally connected to an electronic cash register that also feeds data to the central database.

d. Online Analytical Processing (OLAP)

Online analytical processing allows end users to retrieve data from a system and perform analysis using statistical and graphical tools.

e. Scanners

Technology now allows for infrared *scanners* and bar code scanners to be handheld and mobile so that inventory and point-of-sale data can be collected in real time. Flatbed scanners with document feeders allow data to be entered into databases more rapidly and efficiently than the conventional method of end users retyping handwritten data. OCR (optical character recognition) and handwriting recognition software can convert the scanned documents into searchable text.

f. Importing and Exporting Data

Programs can now share data by exporting the data from one program and then importing the data into a different program that can interpret the data file. For example, an inventory program can export data from the latest inventory count into a file that can be imported into the accounting program that will use this data to estimate the value of the inventory.

F. Centralized vs. Decentralized (Distributed) Processing

1. Centralized Processing

- a. Centralized processing environments maintain all data and perform all data processing at a central location. If end-user PCs are used merely to connect to a LAN to allow data entry from remote locations, and all editing and other such processing is accomplished by programs running on the central processors, the processing is considered centralized. If the end-user PCs actually have application software that performs part of the data validation, the processing would be considered decentralized. Today, centralization and decentralization are often a matter of degree.
- Mainframe and large server computing applications are often examples of centralized processing.

2. Decentralized (Distributed) Processing

- a. Decentralized processing occurs when computing power, applications, and work are spread out (or distributed) over many locations (e.g., via a LAN or WAN).
- b. Decentralized processing environments often use distributed processing techniques, where <u>each remote computer performs a portion of the processing</u> (e.g., a portion of the data validation), thus <u>reducing the processing burden on the central computer or computers</u>.

3. Advantages of Centralized Processing

a. Enhanced Data Security

Data is better secured once it has been received at the central location. Only a single location must be secured rather than having many locations that are geographically separate.

b. Consistent Processing

Processing is more consistent. <u>Decentralized systems may result in inconsistent processing at the various processing locations</u>. Even if the same software is used at each remote processing location, processing can be inconsistent because of factors such as timing or problems affecting only certain locations.

4. Disadvantages of Centralized Processing

a. Possible High Cost

The <u>cost of transmitting large numbers of detailed transactions</u> can be high, although these costs are falling.

b. Increased Need for Processing Power and Data Storage

The central processing location can have increased processing power and data storage needs.

c. Reduction in Local Accountability

There is a reduction in *local accountability* if processing is centralized.

d. Bottlenecks

Input/output bottlenecks can occur at high-traffic times.

e. Delay in Response Time

It may be difficult for the central processing location to respond in a timely manner to information requests from remote locations.

f. Increased Vulnerability

Since all processing is taking place in a single location, <u>problems at that location</u> can cause delays or other problems throughout the organization.

G. End-User Computing

End-user computing (EUC) is the hands-on use of computers by end users. Functional end users do their own information processing activities with hardware, software and professional resources provided by the organization. A common EUC application is information retrieval from the organization's database using the query language feature of database management systems (DBMS). The data can be extracted then manipulated by the end user with spreadsheet software or other analytical tools.

IV. REPORTING

Information output from a business information system is usually one of three forms: (i) a document; (ii) a report; or (iii) a response to a query. Documents are typically operational outputs such as invoices or checks. Reports, both standard and customized, are prepared for both internal and external users. End users can obtain a variety of information through different types of reports.

A. Periodic Scheduled Reports

Periodic scheduled reports are the traditional reports that display information in a predefined format and are <u>made available on a regular basis to end users of the system</u>. The reports may be automatically printed or may be made available via report-viewing software and then printed only if a hard copy is actually needed.

EXAMPLE

An example of a periodic scheduled report is a weekly commission report of all the salespeople for a particular sales manager. Another example of this type of report is a monthly financial statement produced as a part of the closing process. This financial statement might be produced on the same workday of each month.

B. Exception Reports

Exception reports are produced when a specific condition or exception occurs. In other words, specific criteria are established, and any transaction or entity that meets the criteria is reported on the exception report.

EXAMPLE

A report that displays the names, credit balances, and credit limits of every <u>customer whose credit balance is</u> <u>greater than the credit limit</u> is an example of an exception report.

C. Demand Reports Pull

A *demand report* is available on demand. This type of report is sometimes referred to as a response report because an end user can log onto a workstation and obtain a response in the form of a report without waiting for scheduled report creation. Demand reports may be automatically printed or may be made available online and then printed if a hard copy is actually needed.

D. Ad Hoc Reports

1. Definition

One of the most attractive features of a well-designed MIS (management information system) is the ability of an end user to be able to print an "ad hoc" report. An <u>ad hoc</u> report is one that does not currently exist but that can be created on demand, without having to get a software developer or programmer involved. This capability is often called a user report writer.

2. Query

A *query* is a set of criteria that the end user can send to the system to extract all transactions or other information that meet these criteria. Some query systems are very structured and require little knowledge to use effectively. Others require a considerable amount of knowledge and rudimentary programming skills to use effectively.

EXAMPLE

Assume that a national sales manager needs a listing of all the sales transactions occurring in the period from February 11 to February 15, Year 2, that were over \$50,000 in the state of New York. A predefined report matching these criteria will probably not exist. However, if the system has an ad hoc report writer, this report can normally be produced very quickly.

E. Push Reports

Under *push reporting*, information can actually be "pushed" and sent to a computer screen or computer desktop. Files may be delivered as attachments to e-mail messages or via a Webbased report channel. If a report window displays up-to-date reports every time an end user logs into a computer network, the reports would be considered push reports. Push reports can be the specific internal reports of a particular organization, general industry reports, or information downloaded and possibly aggregated from the Internet.

An end user creates a template or profile specifying the information desired. A program then searches for content that meets the requirements of the profile and sends the information to the end user's desktop without further action on the user's part.

EXAMPL

Brown Manufacturing uses just-in-time inventory. A push report is sent to the inventory manager and the plant manager any time a supplier is late with a shipment.

F. Dashboard Reports

Dashboard reports are used by organizations to present summary information necessary for management action. If the information indicates that activities are not within management risk tolerances or plans, management can take corrective action. Dashboards are generally designed to be visual quick references (using charts, graphs, etc.). Several tools can be used to create dashboards, including Microsoft Excel™. Some accounting software provides a type of dashboard so that the user sees things such as cash position, expense breakdown, and other important operational data on the home page when the program is launched.

G. XBRL (Extensible Business Reporting Language)

XBRL is derived from XML (Extensible Markup Language). XBRL tags define the data (provide meta-data). For example, tags could indicate the taxonomy used (GAAP or IFRS), the currency, the time period, as well as the definition of the element.

- 1. XBRL is an open, royalty-free, Internet-based information standard for business reporting of financial data.
- 2. XBRL tags define the data so that users can create macros or other programs that can automate analysis of the data. A macro could be written that would download XBRL tagged financial statements, identify current assets and current liabilities, then calculate the current ratio. Because the tags are standardized through the use of taxonomies, the user can be confident that the current ratios computed for different companies will be comparable.

V. ROLE OF INFORMATION TECHNOLOGY IN BUSINESS STRATEGY

The design of an information system's architecture and the acquisition of technology are important aspects of an entity's business strategy. Choices regarding technology can be critical to achieving an entity's objectives. Technology decisions should be an input to the strategy process, helping to define innovations and seeking to increase revenue, rather than merely an after-the-fact tool for achieving goals.

EXAMPLE

Bell, a computer manufacturer, might adopt a strategy to build-to-order and sell directly to the end users of its products and services on the Internet rather than selling in a retail store. Selling online would permit current and prospective customers direct access to the company. Bell could realize significant cost savings by not having retail outlets and stocking inventory. In this case, technological capabilities actually define the strategy. Without the investment in technology for e-commerce, customer service, etc., this strategy would not be viable.

A. Common Principles of Technology-Driven Strategy Development

- 1. <u>Technology is a core input to the development of strategy</u>, just as much as customers, markets, and competitors.
- 2. Because of the speed with which technology changes, <u>strategy development must be a continual process</u>, rather than something that is revisited every three to five years.
- 3. <u>Innovative emerging business opportunities must be managed separately and differently than core businesses.</u>
- 4. Technology has the <u>power to change long-held business assumptions</u>; managers and executives must be open to this.
- 5. Technology must be managed from two perspectives: (i) its ability to create innovation in existing businesses; and (ii) the ability of emerging technologies to create new markets/products.
- 6. The focus should be on customer priorities as well as internal efficiencies.

EXAMPLE

A brokerage firm was able to leverage faster computers and grid computing to develop a faster response to customers who make inquiries online. Rather than have customers enter questions and data online, then wait to receive a recommendation several hours later in e-mail, the response can be generated within seconds. This product innovation was very popular with customers.

B. The Role of Technology in Information and Communications

- 1. Technology plays a crucial role in enabling the *flow of information* in an organization, including information directly relevant to enterprise risk management across strategy setting and the whole organization. The selection of specific technologies to support enterprise risk management for an organization typically is a reflection of the:
 - a. entity's approach to enterprise risk management and its degree of sophistication;
 - b. types of events affecting the entity;
 - c. entity's overall information technology architecture; and
 - d. degree of centralization of supporting technology.

2. Enterprise risk management includes a number of key components that enable an organization to identify, assess, and respond to risk. Monitoring risk through control activities and information systems is critical to the achievement of objectives.

a. Information Management Approaches

In some organizations, information is managed separately by unit or function, whereas others have integrated systems. As enterprise resource planning (ERP) systems have matured, more companies are moving toward integrated systems that can share information throughout the organization.

b. Availability and Usefulness of Data

Some organizations have enhanced their technology architectures to allow greater connectivity and usability of data, with increased use of the Internet. Web-services based information strategies enable real time information capture, maintenance, and distribution across units and functions, often enhancing information management.

c. Types of Events Affecting the Entity

Event identification is integral to enterprise risk management. <u>Events might be</u> <u>adverse (representing risks) or positive (representing opportunities)</u>. Selection of information technology systems and procedures are driven by strategies that capitalize on opportunities and mitigate risks.

d. Information Technology Architecture

Various methods of organizing technology resources may be used to accomplish organization objectives. This organization of resources is generally referred to as technology architecture.

(1) Customized Systems

Some companies develop customized systems for handling information systems requirements. Customized systems are often characterized by data warehouses to support the entity's management.

(2) Open Architecture

Open architectures utilize such technologies such as XBRL, XML, and Web services to facilitate data aggregation, transfer, and connectivity among multiple systems.

SYSTEMS DESIGN AND OTHER ELEMENTS

- I. BUSINESS PROCESS DESIGN (integrated systems, automated, and manual interfaces)
 - A. Categories of Business Information Systems

TPS 1. Transaction Processing Systems

Transaction processing systems are the systems that process and record the routine daily transactions necessary to conduct business. The functions of such a system are normally predefined and highly structured. In high-volume situations, a premium may be placed on system speed and efficiency

EXAMPLE

Examples of transaction processing systems are sales order entry and tracking systems, hotel and airline reservation systems, payroll and human resources systems, and accounting systems of all types.

MIS 2. Management Information Systems (MIS)

Tactical

A management information system (MIS) provides users predefined reports that support effective business decisions. MIS reports may provide feedback on daily operations, financial and nonfinancial information to support decision making across functions, and both internal and external information.

DSS 3. Decision Support Systems (DSS)

A decision support system (DSS) is an extension of an MIS that provides interactive tools to support decision making. A DSS may provide information, facilitate the preparation of forecasts, or allow modeling of various aspects of a decision. It is sometimes called an expert system

EXAMPLE

Examples of decision support systems include production planning, inventory control, bid preparation, revenue optimization, traffic planning, and capital investment planning systems.

Executive Information Systems (EIS)

Executive information systems (EIS) provide senior executives with immediate and easy access to internal and external information to assist in strategic decision making. An EIS consolidates information internal and external to the enterprise and reports it in a format and level of detail appropriate to senior executives.

EXAMPLE

Examples of executive information systems include sales forecasting, profit planning, key performance indicators, macroeconomic data, and financial reports.

B. Systems Development Life Cycle (SDLC)

The systems development life cycle provides a framework for planning and controlling the detailed activities associated with systems development. Several SDLCs are in use today, but the waterfall approach is the most popular one. It simplifies task scheduling, because there are no overlapping steps. It consists of sequential steps of analysis, planning, design and implementation which flow in a single "downward" direction like a waterfall. One step must be completed before the next one is started.

The prototyping model is an alternative. In this method, an approximation of a final system is built, tested, and reworked as necessary until an acceptable prototype is finally achieved. Next, the complete system is developed from the prototype.

1. Systems Analysis

The first step in systems development is a *systems analysis* that includes the following steps:

- a. Define the nature and scope of the project and identify its strengths and weaknesses.
- b. Conduct an <u>in-depth study</u> of the proposed system to <u>determine its technological</u> and economic feasibility.
- c. Identify the information needs of system users and managers.
- d. Document the information needs of system users and managers.
 - (1) Needs are used to develop and document systems requirements.
 - (2) Systems requirements are used to select or develop a new system.
- e. Prepare a report to summarize the work done during a systems analysis and submit to appropriate levels of management.

2. Conceptual Design

The company <u>decides how to meet user needs</u> during the *conceptual design* phase. This phase likely includes the following steps:

- a. Identify and evaluate appropriate design alternatives. New systems might involve buying software, developing software in-house, or outsourcing systems development.
- Develop detailed specifications outlining what the system is to accomplish and how it is to be controlled.

3. Physical Design

The company uses the conceptual design to develop detailed specifications that are used to code and test the computer programs. This phase will likely include the following steps:

- a. Design output documents. By <u>beginning the design process with identifying</u> <u>outputs</u>, the designers are less likely to overlook elements (fields) that need to be captured in the database.
- b. Design the database(s) as well as input documents.
- c. Write computer programs.
- d. Create files and databases.
- e. Develop procedures.
- f. Develop controls.
- g. Identify and acquire necessary hardware components.

4. Implementation and Conversion

The *implementation and conversion* phase translates the plan into action and then can be used to monitor the project. This phase may include:

- a. Installation of new hardware and/or software
- b. Hiring or relocation of employees to operate the system
- c. Testing or modifying new processing procedures
- d. Establishing and documenting standards and controls for the new system
- e. Converting to the new system and dismantling the old one
- f. Fine-tuning the system after it is up and running

5. **Training**

Training programs will likely include:

- a. Hardware and software skill training.
- b. Orientation to new policies and operations.
- c. A variety of training options, including vendor-based programs, self-study manuals, computer-assisted instruction, videotape presentations, etc.

6. Testing

System testing will likely include:

- a. tests of the effectiveness of documents and reports, user input, operating and control procedures, processing procedures, and computer programs.
- b. tests of capacity limits and backup and recovery procedures.

7. Operations and Maintenance

During its life, the system should be periodically reviewed. Modifications should be made as problems arise or as new needs become evident. If a major modification or system replacement eventually becomes necessary, the SDLC begins again. The operations and maintenance phase (indeed the entire life cycle) may also include planning, managing the behavioral reactions to change, and assessing the ongoing feasibility of the project.



PASS KEY

The steps in the systems development life cycle (SDLC) can be remembered with the mnemonic A DITTO:

- Systems <u>A</u>nalysis
- <u>D</u>esign (Conceptual and Physical)
- Implementation and Conversion
- <u>I</u>raining
- <u>T</u>esting
- Operations and Maintenance

C. Participants in Business Process Design

The participants in business process design form the project team, which typically includes the following parties:

1. Management

One of the most effective ways to generate systems development support is to send a clear signal from top management that user involvement is important. Top management's most important roles are providing support and encouragement for development projects and aligning information systems with corporate strategies. Because business process design will often take time away from other duties, management must ensure that team members are given adequate time and support to work on the project.

2. Accountants

Accountants may play three roles during systems design:

- a. As AIS users, the accountants should determine their <u>information needs and system</u> requirements, and communicate these needs to system developers.
- b. As members of the project development team or information systems steering committee, they can help manage system development.
- c. As accountants, they should take an <u>active role in designing system controls</u>, and periodically monitoring and testing the system to verify that the controls are implemented and functioning properly.

3. Information Systems Steering Committee

An executive-level *information systems steering committee*, also known as the project steering committee, should <u>plan and oversee the information systems function and</u> address the complexities created by functional and divisional boundaries.

- a. The committee often consists of high-level management, such as the controller and systems and user-department management.
- b. Functions of the steering committee include:
 - (1) Setting governing policies for the AIS;
 - (2) Ensuring top-management participation, guidance, and control; and
 - (3) Facilitating the coordination and integration of information systems activities to increase goal congruence and reduce goal conflict.

4. Project Development Team

The team members planning each project are responsible for the successful design and implementation of the business system. The team should work to ensure both technical implementation and user acceptance. Their tasks include:

- a. Monitoring the project to ensure timely and cost-effective completion.
- b. Managing the human element (e.g., resistance to change).
- c. Frequently communicating with users and holding regular meetings to consider ideas and discuss progress so there are no surprises upon project completion.
- d. Risk management and escalating issues that cannot be resolved within the team.

5. External Parties (major customers or suppliers)

Many people outside an organization play a role in systems development, including customers, vendors, auditors, and governmental entities. For example, a major retailer may require that its vendors implement and use electronic data interchange (EDI).

II. INFORMATION TECHNOLOGY (IT) CONTROL OBJECTIVES

The Control Objectives for Information and Related Technology (COBIT) framework provides managers, auditors and information technology (IT) users with a set of measures, indicators, processes and best practices to maximize the benefit of information technology. In addition, the COBIT framework is intended to assist in the development of appropriate IT governance and IT management within an organization. COBIT was created by the Information Systems Audit and Control Association (ISACA) and the IT Governance Institute (ITGI) in 1992. It has been updated several times as technology has changed, with the most recent being COBIT 5, released in 2012.

The COBIT framework is organized as follows:

A. Business Objectives

Business objectives anticipate the global requirements that are typically associated with business owners or process managers as well as IT professionals and auditors. Business objectives might include (but not be limited to):

- 1. Effective decision support.
- 2. Efficient transaction processing.
- 3. Compliance with either reporting requirements (e.g., taxation) or information security requirements and national standards for electronic health care transactions (e.g., the Health Insurance Portability and Accountability Act).

B. Governance Objectives

The COBIT framework anticipates that IT governance will be framed by the following <u>five</u> focus areas:

1. Strategic Alignment

The <u>linkage between business and IT plans</u> is referred to as *strategic alignment* and includes defining, maintaining, and validating the IT value proposition, with a focus on customer satisfaction.

2. Value Delivery

Value delivery includes the <u>provision by IT of promised benefits</u> to the organization, while <u>satisfying its customers and optimizing costs.</u>

3. Resource Management

Resource management focuses on the optimization of knowledge and infrastructure.

4. Risk Management

Risk management is defined as risk awareness by senior management, characterized by understanding risk appetite and risk management responsibilities (e.g., event identification, risk assessments, and responses).

Risk management begins with identification of risks faced followed by determining how the company will respond to the risk. The company can avoid the risk, mitigate the risk, share the risk, or ignore the risk.

EXAMPLE

A health care provider might *avoid* risk by not providing certain high-risk medical procedures, and instead focusing on low-risk basic care.

An online retailer might *mitigate* risk by implementing strict controls over customer account information. Companies *share* risk by purchasing insurance.

Ignoring risk would be an option only if the risk presents low impact and small probability.

5. Performance Measurement

Features of *performance measurement* include tracking and monitoring strategy implementation, project completion, resource usage, process performance, and service delivery. It is important to define milestones and/or deliverables throughout the project so that progress toward completion can be measured.

C. Information Criteria

COBIT describes the business requirements for information with seven distinct criteria.

Remember the ICE RACE to know the seven information criteria (the business requirements for information). Know it cold and learn it fast. Integrity Reliability Confidentiality Availability Efficiency Compliance Effectiveness

1. Integrity

Information integrity includes accuracy, completeness, and validity.

2. <u>C</u>onfidentiality

Confidentiality is the <u>protection of sensitive information</u> from unauthorized disclosure. Ensuring confidentiality requires that confidential material be clearly defined and that employees are properly trained in how to identify and protect confidential information.

3. Efficiency

Efficiency is the delivery of information through the optimal use of resources (e.g., <u>low</u> cost without compromising effectiveness).

4. Reliability

Reliable information represents what it purports to represent and is appropriate to operating the entity.

5. Availability

Information availability includes <u>providing current and future information as required</u>, and the safeguarding of information resources.

6. Compliance

Information must comply with policies, laws, regulations and contractual arrangements (internal and external) by which a business process is governed.

7. <u>Effectiveness</u>

Effective information is relevant or pertinent to a business process, and delivered in timely, correct, consistent, and useful manner.

D. IT Resources

IT uses clearly defined processes to deploy people skills and technology infrastructure to run automated business applications and leverage business information. The resources and the processes are collectively referred to as the *enterprise architecture* for IT.

1. Applications

Automated user systems and manual procedures that process information are referred to as applications. Examples of common applications include billing systems and payroll systems.

2. Information

Information is defined by COBIT as data in its broadest form at all stages of processing used by the business, including:

- a. Raw input data
- b. Processed data (at various stages)
- c. Output information

3. Infrastructure

The technology and facilities that enable data processing are referred to as *infrastructure* including:

- a. Hardware
- b. Operating systems
- c. Networking
- d. Physical plant

4. People

IT professionals, who provide IT functions, including planning, organizing, acquiring, implementing, delivering, supporting, monitoring, and evaluating information systems and services. Both internal and outsourced resources are included.

E. Domains and Processes of COBIT

COBIT defines IT processes within the context of four domains that direct the delivery of solutions and services and ensure that directions are followed.

Remember the four domains of the COBIT Framework as you get ready to buy computer equipment in a company setting. You will need a purchase order (PO) and, therefore, a: PO AIDS ME				
Solution	Al	Acquire and Implement		
<u>Service</u>	DS	Deliver and Support		
Ensure direction followed	ME	Monitor and Evaluate		

1. Plan and Organize

Planning and organizing provides direction to solution and service delivery.

2. Acquire and Implement

Acquiring and implementing provides solutions for IT needs.

3. <u>Deliver and Support</u>

Delivery and support provides IT services to users (e.g., translating solutions into services received by end users.

4. <u>Monitor and Evaluate</u>

Monitoring and evaluation ensure that the direction provided in the planning and organizing steps are followed in the solution and service processes.

III. ROLE OF TECHNOLOGY SYSTEMS IN CONTROL MONITORING

A. General and Application Controls

IT controls can be grouped into two major categories: general controls and application controls.

1. **General Controls**

General controls are designed to ensure that an organization's control environment is stable and well-managed, and include:

- a. Systems development standards
- b. Security management controls
- c. Change management procedures
- d. Software acquisition, development, operations, and maintenance controls

2. Application Controls

Application controls prevent, detect, and correct transaction error and fraud and are application-specific, providing reasonable assurance as to system:

- a. Accuracy
- b. Completeness
- c. Validity
- d. Authorization

B. Input Controls

The following source data controls regulate the integrity of input, which is crucial to accurate and complete output:

- 1. <u>Data validation at the field level</u> (edit checks, meaningful error messages, input masks, etc.).
- 2. <u>Prenumbering forms</u>, making it possible to verify that all input is accounted for and that no duplicate entries exist.
- 3. Well-defined source data preparation procedures, which are used to collect and prepare source documents. (Sometimes, no source documents exist because the data is entered automatically via a Web-based application or document scanning.)

C. Processing Controls

Important processing controls include the following:

1. Data Matching

Matching two or more items of data prior to taking an action improves transaction processing (e.g., controls should include matching information on the vendor invoice to both the purchase order and the receiving report before paying a vendor).

2. File Labels

Use of *file labels* ensures that the correct and most current files are updated. External labels are readable by humans, while internal labels are written in machine-readable form on the data recording media. Both internal and external labels should be used. External labels are easily altered so that internal labels are more secure. Two important types of internal labels are header and trailer records.

 The header record is located at the beginning of each file and contains the file name, expiration date, and other identification data. b. The trailer record is located at the end of the file and contains the batch totals calculated during input.

3. Recalculation of Batch Totals / Hash totals

Comparison of amounts input to amounts output ensures that the volume of transactions processed is correct. Hash totals (such as a sum of invoice numbers) can also be used to confirm that the correct source documents are included. If someone substituted a different invoice with the same amount, the batch total would agree but the hash total would not.

4. Cross-Footing and Zero-Balance Tests

Testing the sum of a column of row totals to the sum of a row of column totals to verify identical results provides some assurances as to accuracy. A zero-balance test requires the use of control accounts. For example, the payroll clearing account is debited for the total gross pay of all employees. It is then credited for the amount of all labor costs allocated to various expense categories. The payroll clearing account should have a zero balance after these entries have been made; a nonzero balance indicates a processing error.

5. Write-Protection Mechanisms

Common file protections guard against the <u>accidental writing over or erasing of data</u> files stored on magnetic media. However, it is important to remember that these provide protection from accidental erasure but most write-protection mechanisms are easily removed.

6. <u>Database Processing Integrity Procedures</u>

Database systems use database administrators, data dictionaries, and concurrent update controls to ensure processing integrity.

- a. The administrator establishes and enforces procedures for accessing and updating the database.
- b. The data dictionary ensures that data items are defined and used consistently.
- c. Concurrent update controls protect records from errors that occur when two or more users attempt to update the same record simultaneously. This is accomplished by locking out one user until the system has finished processing the update entered by the other.

D. Output Controls

Verification of system output provides additional control over processing integrity. *Output controls* include:

1. <u>User Review</u> of Output

<u>Examination by users</u> of system output <u>for reasonableness</u>, <u>completeness and verification that the output is provided to the intended recipient.</u>

2. Reconciliation Procedures

Reconciliation of individual transactions and other system updates to control reports, file status or update reports (e.g., reconcile input control totals to output control totals).

3. External Data Reconciliation

Reconciliation of database totals with data maintained outside the system (e.g., the number of employee records in the payroll file should be compared with the total from human resources to detect attempts to add fictitious employees to the payroll database).

4. Output Encryption

The <u>authenticity and integrity of data outputs must be protected</u> during transmission.

- Encryption techniques reduce the chance for data interception.
- b. Controls should be designed to minimize the risk of data transmission errors.
 - (1) When a receiving unit detects a data transmission error, it requests the sending unit to retransmit that data. Generally, the system will do this automatically and the user is unaware that it has occurred.
 - (2) Parity checking and message acknowledgement techniques are two basic types of data transmission controls. Parity checking is the process of taking the sum of the bits in a byte and adding either a zero or one to make the byte even for even parity or odd for odd parity. If the message arrives and a bit has changed during transmission, then it is recognized and the message can be resent.

E. Managing Control Activities

It is important to establish controls related to the use of information technology resources. Budgets should be established for the acquisition of equipment and software, for operating costs, and for usage. Actual costs should be compared with budgeted amounts, and significant discrepancies should be investigated.

Specific information technology control procedures include:

1. A plan of organization that includes appropriate segregation of duties to reduce opportunities for anyone to be in a position to both perpetrate and conceal errors or irregularities in the normal course of his or her duties.

EXAMPLE

Programmers should not have access to source code and production data. They should only make changes in a test environment with test data. Otherwise, a programmer could alter the program to commit fraud and then change the program back so that the fraud would be undetected.

- 2. Procedures that include the design and use of adequate documents and records to help ensure the proper recording of transactions and events.
- 3. Limits to asset access in accordance with management's authorization. For example, a data librarian controls production data and programs and only checks it out to authorized persons at authorized times.
- 4. Effective performance management, with clear definitions of performance goals and effective metrics to monitor achievement of goals.
- 5. Information processing controls are applied to check for proper authorization, accuracy, and completeness of individual transactions.

- 6. The proper design and use of electronic and paper documents and records help ensure the accurate and complete recording of all relevant transaction data.
- 7. Implementation of security measures and contingency plans.
 - a. Security measures focus on preventing and detecting threats. Data security controls should be designed to ensure that authorization is required to access, change, or destroy storage media.
 - b. Contingency plans detail the procedures to be implemented when threats are encountered. One goal of the contingency plan would be to minimize disruption of processing while ensuring the integrity of data input and processing.
 - c. It is a well-accepted concept in information system security that some active threats cannot be prevented without making the system so secure that it is unusable.

IV. OPERATIONAL EFFECTIVENESS

Evaluating the ongoing *effectiveness* of control policies and procedures provides added assurance that controls are operating as prescribed and achieving their intended purpose. A diagnostic control system compares actual performance to planned performance.

A. Diagnostic Controls

Diagnostic controls are designed to achieve efficiency in operations of the firm to get the most from resources used.

B. Control Effectiveness

The following principles of control should be applied to systems development and maintenance:

1. Strategic Master Plan

To align an organization's information system with its business strategies, a multiyear strategic master plan should be developed and updated annually. The plan should show the projects that must be completed to achieve long-range company goals and address the company's hardware, software, personnel, and infrastructure requirements.

2. Data Processing Schedule

All data processing tasks should be organized according to a data processing schedule.

3. Steering Committee

A steering committee should be formed to guide and oversee systems development and acquisition.

4. System Performance Measurements

For a system to be evaluated properly, it must be assessed using *system performance measurements*. Common measurements include throughput (output per unit of time), utilization (percentage of time the system is being productively used), and response time (how long it takes the system to respond).

V. IT RESPONSIBILITIES AND SEGREGATION OF DUTIES = People

A. Roles and Responsibilities of Information Technology Professionals

Information technology professionals include administrators (for the database, the network, and the Web), librarians, computer operators, and developers (for systems and applications). The roles and responsibilities of IT professionals are defined individually by each organization, and, as indicated previously, job titles and responsibilities can vary widely depending on the needs of the organization and, in some cases, the personal preferences of IT management.

1. System Analyst

a. Internally Developed System

- (1) works with end users to determine system requirements
- (2) designs the overall application system
- (3) determines the type of network needed

b. Purchased System

- (1) integrates the application with existing internal and purchased applications
- (2) provides training to end users

2. Computer Programmer

Computer programmers include application programmers and system programmers.

a. Application Programmer/Software Developer (software engineers)

- (1) An application programmer is the person responsible for writing and/or maintaining application programs. A considerable number of the new ideas for the IT industry have been devoted to techniques to minimize or facilitate program maintenance.
- (2) For internal control purposes, application programmers should not be given write/update access to data in production systems or unrestricted and uncontrolled access to application program change management systems.

b. System Programmer

- (1) A system programmer is responsible for installing, supporting (troubleshooting), monitoring, and maintaining the operating system. System programmers may also perform capacity planning functions. In complex computing environments, a considerable amount of time can be spent testing and applying operating system upgrades.
- (2) For internal control purposes, system programmers should not be given write/update access to data in production systems or access to change management systems.

3. Computer Operator

Computer operators are responsible for scheduling and running processing jobs. Much of the job of scheduling and running jobs can be automated and, in large computing environments, must be automated due to the sheer volume of information processed.

4. IT Supervisor

IT supervisors manage the functions and responsibilities of the IT department.

5. File Librarian

File libraries store and protect programs and tapes from damage and unauthorized use, and file librarians control the file libraries. In <u>large computing environments</u>, much of this work is automated.

6. Data Librarian

In large companies, the data librarian has <u>custody of and maintains the entity's data and</u> ensures that production data is released only to authorized individuals when needed.

7. Security Administrator

Security administrators are responsible for the assignment of initial passwords and often the maintenance of those passwords (if the end users do not maintain their own passwords). Security administrators are responsible for the overall operation of the various security systems and the security software in general.

8. System Administrator

a. Database Administrator (DBA)

Database administrators are responsible for maintaining and supporting the database software and performing certain security functions. Database administrators perform similar functions for database software as system programmers perform for the operating system as a whole.

★ Database administrators differ from data administrators; a database administrator is responsible for the actual database software, while a data administrator is responsible for the definition, planning, and control of the data within a database.

b. Network Administrator

Network administrators support computer networks through performance monitoring and troubleshooting. Sometimes, network administrators are called telecommunication analysts or network operators.

c. Web Administrator

Web administrators are responsible for information on a website.

9. Data Input Clerk

Data input personnel prepare, verify, and input data to be processed. Increasingly, however, that function is being distributed to the end users.

10. Hardware Technician

A hardware technician sets up and configures hardware and troubleshoots any resulting hardware problems.

11. End User

End users are any workers in an organization who enter data into a system or who use the information processed by the system. End users now routinely enter much of their own data or transactions.

Segregation of Duties Within Information Technology

In a well-structured IT department, the duties discussed below are segregated. Because many transactions in an IT environment are actually performed by the application software, segregation of duties normally revolves around granting and/or restricting access to production programs and to production data.

System Analysts vs. Computer Programmers -> Software designer

designer

System & System analysts design an information system to meet user needs whereas computer programmers use that design to create an information system by writing computer programs. Analysts often are in charge of hardware and programmers are in charge of application software. Theoretically, if the same person is in charge of hardware and software, that person could easily bypass security systems without anyone knowing and steal organizational information or assets (e.g., embezzling of funds).

2. **Computer Operators vs. Computer Programmers**

It is important that computer operators and computer programmers be segregated because a person performing both functions could make unauthorized and undetected program changes.

3. Security Administrators vs. Computer Operators and Computer Programmers

Security administrators are responsible for restricting access to systems, applications, or databases to the appropriate personnel. If the security administrator were also a programmer or an operator for that system, that person could give himself/herself or another person access to areas they are not authorized to enter. This security bypass would also allow that person to steal organizational information or assets.

VI. POLICIES

Purpose Δ

IT policies represent management's formal notification to employees regarding the entity's objectives. Policies surrounding system design should promote communication.

В. **Implementation**

Authority and responsibility are assigned through formal job descriptions, employee training. a formal company code of conduct, a written policy and procedures manual, operating plans, schedules, and budgets.

SECURITY

I. TECHNOLOGIES AND SECURITY MANAGEMENT FEATURES

Data and procedural controls are implemented to ensure that data is recorded, errors are corrected during processing, and output is properly distributed.

A. Safeguarding Records and Files

Data can be protected through the use of internal and external labels and file protection rings. All critical application data should be backed up and stored in a secure off-site location.

B. Backup Files

Data backups are necessary both for recovery in a disaster scenario and for recovery from processing problems. Copies of key master files and records should be stored in safe places located outside of the company. Copies of files kept on-site should be stored in fireproof containers or rooms.

1. Son-Father-Grandfather Concept

In a son-father-grandfather backup system, the most recent file is called the son, the second most recent file is called the father, and the preceding file is called the grandfather. The backup process includes reading the previous file, recording

transactions being processed, and then creating a new updated master file. The periodic transaction files are stored separately. If the son file is destroyed, a new file can be reproduced by using the transaction file and the father file to create a new son file. With this system of safeguarding, there are always at least two backup files that can be used to re-create the destroyed file.

2. Backup of Systems That Can Be Shut Down

The backup process is relatively simple when a system can be shut down for backup and maintenance. When this is the case, <u>files or databases that have changed since</u> the last backup (or just all data) can be backed up, using the son-father-grandfather or similar concept.

3. Backups of Systems That Do Not Shut Down

Effective backups are more difficult when an information system cannot be shut down. Recovery often includes applying a transaction log (a file of the transactions that had been applied to the databases) and reapplying those transactions to get back to the point immediately before the failure.

4. Mirroring

Mirroring is the use of a backup computer to duplicate all of the processes and transactions on the primary computer. Mirroring, which can be expensive, is sometimes used by banks and other organizations for which downtime is unacceptable.

C. Uninterrupted Power Supply

An uninterrupted power supply (UPS) is a device that maintains a continuous supply of electrical power to connected equipment. A UPS is also called battery backup. A UPS is used to prevent a system from shutting down inappropriately during an outage. A UPS can prevent data loss and can protect the integrity of a backup while it is being performed. When a power failure occurs, the UPS switches to its own power source instantaneously so that there is no interruption in power to the system.

A UPS is not a backup standby generator; the battery will run out sooner or later. Because a backup generator will not provide protection from a momentary power interruption, it is critical that the UPS be able to provide power without any interruption so that data will not be corrupted.

D. **Program Modification Controls**

Program modification controls are controls over changes to programs being used in production applications. Program modification controls include both controls designed to prevent changes by unauthorized personnel and controls that track program changes so that there is a record of what versions of what programs are running in production at any specific point in time.

E. Data Encryption

Encryption is an essential foundation for electronic commerce. Encryption involves using a password or a digital key to scramble a readable (plaintext) message into an unreadable (ciphertext) message. The intended recipient of the message then uses another digital key to decrypt or decipher the ciphertext message back into plaintext. With encryption keys, the longer the length of the key, the less likely is the message or transaction to be decrypted by the wrong party and the less likely the key is to be broken by a *brute-force attack*. In a brute-force attack, the attacker simply tries every possible key until the right one is found.

If encrypted content is communicated by an entity (a person or a machine) using cryptography, the sender is the entity that encrypts and the receiver is the entity that decrypts the content. Between the sender and the receiver lies the unsecured environment where the garbled message travels. When encrypted content is stored, rather than transferred between a sender and a receiver, authorized users have the ability to encrypt and decrypt the content so they can use it for authorized purposes.

1. <u>Digital Certificates</u>

Digital certificates, another form of data security, are electronic documents created and digitally signed by a trusted party which certifies the identity of the owners of a particular public key. The digital certificate contains that party's public key.

The term <u>public key infrastructure (PKI)</u> refers to the <u>system and processes used to</u> issue and manage asymmetric keys and digital certificates. The <u>organization that issues</u> <u>public and private keys and records the public key in a digital certificate is called a <u>certificate authority.</u> Digital certificates intended for e-business use are typically issued by commercial certificate authorities, such as Comodo and VeriSign. The certificate authority hashes the information stored on a digital certificate and then encrypts that hash with its private key. That digital signature is then appended to the digital certificate, which provides the means for validating the authenticity of the certificate.</u>

2. Digital Signatures vs. E-Signatures

Digital signatures use asymmetric encryption to create legally-binding electronic documents. Web-based e-signatures are an alternative and are provided by vendors as a software product. The e-signature is a cursive-style imprint of a person's name that is applied to an electronic document. E-signatures are legally-binding, just as if the user had really "signed" a paper copy of the document.

- With encryption keys, the longer the length of the key and the more sophisticated the algorithm, the less likely that the message or transaction will be decrypted by the wrong party.
- The longer the key, the less likely the key could be broken by a brute-force attack. In a brute-force attack, the attacker simply tries every possible key until the right one is found. The longer the key, the more possible combinations and the longer until the correct key would be located. One of the most popular encryption methods uses a key length of 128 bits. This provides a tremendous number of combinations that a hacker would need to try to break the key. In point-to-point transmissions, encryption can provide a reasonable level of security.
- By maintaining the private key as a secret and only offering the public key to known parties, access is limited. Because only trusted parties have access to the keys, users can feel confident of the privacy of the transaction. However, this does not mean the communication is perfect or that hackers are not trying to develop software that would break encryption schemes.

EXAMPLE

A local bank uses encryption methods (symmetric and asymmetric) and hashing in all of its online banking transfers. The bank has previously used a digital certificate from a trusted certificate authority (CA), such as Symantec or Network Solutions. A bank customer wants to make an online transfer between accounts. The encrypted transaction will be processed as follows:

STEP 1

When a bank customer visits the bank's website, he or she will notice the lock icon displayed at the bottom of the screen once the customer clicks on a "Money Transfer" button or its equivalent. The bank customer's browser software will then obtain the website's digital certificate, verify its validity, and open it to get the bank's public key. The bank's website software follows the same concept to acquire the user's public key.

STEP 2

Once the bank customer clicks on the "Money Transfer" button to view his or her online banking transactions, the encryption software performs the following steps:

- a. It creates a hash of the money transfer by using a hashing algorithm.
- b. It creates a digital signature for the money transfer by encrypting the hash using the bank customer's private key.
- c. It encrypts the money transfer using the advanced encryption standard (AES) symmetric key in order to protect the confidentiality of the bank customer since only those with the AES key can decrypt the transfer.
- d. The AES key is encrypted by using the bank's public key in order to ensure that only the intended recipient (bank) will be able to decrypt the AES key needed for the money transfer.

STEP 3

The encrypted money transfer (created in step 2c), the AES key needed to decrypt the money transfer (created in step 2d), and the user's digital signature (created in 2b) are all sent over the Internet to the bank.

STEP 4

Once the bank's computer system receives the package of information via the Internet, it performs the following steps:

- a. The system uses the user's public key, obtained in step 1, to decrypt the digital signature created in step 2b, in order to yield the hash of the money transfer that was created by the bank customer.
- b. The system uses its own private key to decrypt the AES key sent by the customer in step 2d.
- c. The system uses the AES key from step 4b to decrypt the encrypted money transfer created in step 2c in order to produce the plaintext version of the customer's transfer.
- d. The system uses the same hashing algorithm used on the user's computer in step 1 to hash the plaintext copy of the money transfer created in step 4c.
- e. The system compares the hash created in step 4d to the one produced in 4a. If there is a match, the bank's system knows that the money transfer has not been changed or corrupted during transmission.

STEP 5

The bank sends the customer an acknowledgement that the money transfer has been received.

F. Managing Passwords

Passwords are designed to protect access to secure sites and information. The first rule in password policy is that every account must have a password. A strong password management policy must address the following password characteristics:

1. Password Length

Longer passwords are generally more effective. Many organizations require a minimum of seven or eight characters.

2. Password Complexity

Complex passwords are more effective and generally <u>feature three of the following four</u> characteristics:

- a. Uppercase characters;
- b. <u>Lowercase</u> characters;
- c. Numeric characters; and
- d. ASCII characters (e.g., !, @, #, \$, %, ^, &, *, or ?).

3. Password Age

Although there is no true standard passwords should be changed frequently in order to be effective; every 90 days is a considered a good policy. Administrative passwords should be changed more frequently.

4. Password Reuse

Although there is no true standard, passwords should not be reused until a significant amount of time has passed. The goal is to prevent users from alternating between their favorite two or three passwords.

G. User Access

Because <u>user accounts are the first target of a hacker, care must be used when designing</u> procedures for creating accounts and granting access to information.

1. <u>Initial Passwords and Authorization</u> for System Access

The first point of contact for a new employee is generally the Human Resources (HR) department. HR should generate the request for a user account and system access rights. Depending on the level of access being granted, the Information Security Officer may also need to approve the account.

2. Changes in Position

Changes in position require coordination of effort between HR and IT.

- a. It is important to have procedures to address changes in jobs/roles and to remove access that is no longer needed.
- b. There must be a mechanism to <u>disable accounts when an employee leaves an organization</u>. The ideal is for HR to alert IT prior to termination, or otherwise, as soon as possible.

II. POLICIES

Policies are the most crucial element in a corporate information security infrastructure and must be considered long before security technology is acquired and deployed.

A. Security Policy Defined

An entity's information security policy is a document that states how an organization plans to protect its tangible and intangible information assets. Security policies include:

- 1. <u>Management instructions</u> indicating a course of action, a guiding principle, or an appropriate procedure.
- 2. <u>High-level statements</u> that provide guidance to workers who must make <u>present and</u> future decisions.

3. Generalized requirements that must be written and communicated to certain groups of people inside, and in some cases outside, the organization.

B. Security Policy Goal

The goal of a good information security policy is to require people to protect information, which in turn protects the organization, its employees, and its customers.

C. States and Locations of Information Covered by Security Policies

- 1. The security policy should seek to secure information that exists in three distinct states:
 - a. Stored information
 - b. Processed information
 - c. Transmitted information
- 2. Information generally resides in the following locations:
 - Information technology systems
 - b. Paper
 - c. Human brain
- 3. Relationship between states and locations of information—the following table illustrates the relationship between the three states of information and the places where information resides.

STATES OF INFORMATION			
Information Location	Stored	Processed	Transmitted
Information systems	Hard drives, physical memory, backup tapes, all portable storage such as CD-ROMs, thumb drives, cellphones, cameras	Server computers, mainframe, computers, desktop computers, portable devices	Via Internet, wide area network (WAN), local area network (LAN), wired, or wireless
Paper	Desks, file cabinets, pockets, briefcases, shredding rooms	Copy machines, fax machines, read by people	Fax, standard postal service, courier, pictures, read by people
Human brain	Long- and short-term memory	All synapses firing	Spoken and sign language

D. Types of Policies

These four types of computer security policies start out at a high level and become more specific (granular) at the lower levels.

1. Program-Level Policy

Program-level policies are used for creating a management-sponsored computer security program. A program-level policy, at the highest level, might prescribe the need for information security and may delegate the creation and management of the program to a role within the IT department. This is the mission statement for the IT security program.

2. Program-Framework Policy

A *program-framework policy* establishes the overall approach to computer security (i.e., a computer security framework). A framework policy adds detail to the program by describing the elements and organization of the program and department that will carry out the security mission. This is the IT security strategy.

3. Issue-Specific Policy

Issue-specific policies address specific issues of concern to the organization (e.g., cloud computing).

4. System-Specific Policy

System-specific policies focus on policy issues that exist for a specific system (e.g., the payroll system).

E. Development and Management of Security Policies

A three-level model can be used to develop a comprehensive set of system policies:

1. Security Objectives

The first step is to define the *security objectives*. The objectives should consist of a series of statements to describe meaningful actions about specific resources. These objectives should be based on system functionality or mission requirements and also state the security actions to support the requirements. Security objectives might relate to confidentiality, data integrity, authorization, access, resource protection and other issues.

2. Operational Security

Operational security should define the manner in which a specific data operation would remain secure (e.g., operational security for data integrity might consider a definition of authorized and unauthorized modification: the individuals authorized to make modifications, by job category, by organization placement, by name, etc.).

3. Policy Implementation

Security is normally enforced through a combination of technical and traditional management methods. Although technical means are likely to include the use of access control technology, other automated means of enforcing or supporting security policy exist. For example, technology can be used to block telephone system users from calling certain numbers. Intrusion detection software can alert system administrators to suspicious activity or take action to stop the activity. Personal computers can be configured to prevent booting from an external drive.

F. Policy Support Documents

Policies are defined as statements of management's intent. Documents that serve to support policies include:

1. Regulations

Laws, rules, and regulations generally represent governmentally imposed restrictions passed by regulators and lawmakers (i.e., Sarbanes-Oxley Corporate Responsibility and Accountability Act, HIPPA, etc.).

2. Standards and Baselines

Topic-specific and system-specific documents that describe overall requirements for security are called, respectively, standards and baselines.

3. Guidelines

Guidelines provide hints, tips and best practices in implementation.

4. Procedures

Procedures are step-by-step instructions on how to perform a specific security activity (configure a firewall, install an operating system, and others).

THE INTERNET

Implications for Business

I. ELECTRONIC COMMERCE AND BUSINESS

A. Electronic Commerce (E-Commerce)

The electronic <u>completion of exchange (buying and selling) transactions</u> is called *e-commerce*. It can use a private network or the Internet.

B. Electronic Business (E-Business)

A more general term than e-commerce is *e-business*, which refers to any use of information technology, particularly networking and communications technology, to perform business processes in an electronic form. The exchange of this electronic information may or may not relate to the purchase and sale of goods or services.

II. ELECTRONIC DATA INTERCHANGE (EDI)

EDI is the computer-to-computer exchange of business transaction documents (e.g., purchase orders, confirmations, invoices, etc.) in structured formats that allow the direct processing of the data by the receiving system. EDI started with buyer-seller transactions (e.g., invoices and purchase orders) but has expanded to inventory management and product distribution. Any standard business document that one organization can exchange with another can be exchanged via EDI if both organizations have made the proper preparations.

EXAMPLE

An example of EDI would be a manufacturer sending an electronic purchase order to a supplier. Instead of sending a paper purchase order or e-mailing an electronic purchase order, the manufacturer's purchasing system sends an electronic purchase order to the supplier's order entry system. The vendor's order entry system responds with a confirmation of the receipt of the order, an estimated price for the order, and an estimate of the shipping date for the order. When the order is shipped, the vendor's accounts receivable system sends an electronic invoice.

To do this, both the sending system and receiving system need to be able to communicate electronically, and an agreement must have been reached on what transactions will be communicated and in what format.

A. Reduced Handling Costs and Increased Processing Speed

Compared to traditional paper-based processing, EDI reduces transaction handling costs and speeds transaction processing.

B. Standard Data Format

EDI requires that all transactions be submitted in a standard data format.

1. Mapping

Mapping is the process of determining the correspondence between data elements in an organization's terminology and data elements in standard EDI terminology. Once the mapping has been completed, translation software can be used to convert transactions from one format to the other.

2. Standards

Several different sets of standards exist, such as ANSI X.12 in the U.S., EDIFACT in Europe, and IPPAA for the health care industry.

XML (extensible markup language) is a technology that has been developed to transmit data in flexible formats instead of the standard formats of EDI. XML tells systems the format of data and also what kind of information the data is. XML uses both standard and user-defined tags, similar to the data formatting tags that are used in HTML for the display of Web pages in browsers.

XML is likely to become the standard for automating data exchange between systems. Currently, XML extensions are being grafted onto EDI; if XML standards can be developed and adopted, XML may replace EDI since XML tags can be read by many different software applications.

C. Communications

EDI can be implemented using direct links between the organizations exchanging information, through communication intermediaries (called service bureaus), through value added networks (VANs or networks of VANs), or over the Internet. A value-added network is a service that operates like e-mail, only with structured data. Company A sends information to a VAN, which in turn sends it on to Company B. Company B can reply back to Company A via the VAN. Internet-based EDI is replacing VAN-based EDI because it is considerably cheaper.

D. Features of EDI

- EDI allows the transmission of electronic documents between computer systems in different organizations. These organizations are often called trading partners or business partners.
- 2. EDI reduces handling costs and speeds transaction processing compared to traditional paper-based processing. However, to actually reduce such costs, the EDI system must be integrated with the organization's accounting information systems.
- 3. EDI requires that all transactions be submitted in a standard data format. Translation software is required to convert transaction data from the internal data format in the sending system into EDI format and vice versa.
- 4. EDI can be implemented using direct links between the trading partners, through communication intermediaries, through VANs or networks of VANs, or over the Internet. VANs are privately owned communications networks that provide additional services beyond standard data transmission. For EDI, those additional services include the provision of a mailbox where EDI transactions are left by one trading partner until they are retrieved by the other trading partner. Internet-based EDI is replacing VAN-based EDI because it is considerably cheaper.

E. Costs of EDI

EDI costs include:

1. Legal Costs

The *legal costs* associated with <u>modifying and negotiating trading contracts with trading partners and with communications providers</u> are costs of EDI.

2. Hardware Costs

Hardware costs, including the cost of required <u>communications equipment</u>, improved servers, modems, routers, etc., are costs of EDI.

3. Costs of Translation Software

The cost of acquiring/developing and maintaining the translation software to translate data into the specific EDI formats can be significant.

4. Costs of Data Transmission

The *cost of data transmission* has been <u>decreasing</u>, especially with the <u>evolution of EDI through the Internet.</u>

5. Process Reengineering and Employee Training Costs for Affected Applications

The implementation of EDI can significantly reduce human effort in the processing of business documents. However, the main advantage of automation such as EDI occurs when EDI processes are heavily integrated into other applications such as inventory control, shipping/receiving, and even production planning. Such changes may require significant business process reengineering.

6. Costs Associated with Security, Monitoring, and Control Procedures

EDI systems need monitoring and troubleshooting to make sure that they are working properly. Security must be tight to ensure that EDI transactions are not received from or sent to unauthorized trading partners. Some controls over EDI can be automated.

F. EDI Controls

Because EDI involves the direct processing of data by a receiving system, generally with little human involvement, controls designed to prevent errors are crucial. Data encryption should be performed by physically secure hardware because software encryption may be subject to unauthorized tampering from remote locations. Audit trails in EDI systems should include:

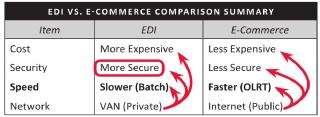
- Activity logs of failed transactions.
- 2. Network and sender/recipient acknowledgments.

Normally, people should follow up on failed transactions. Thus, human effort is not totally eliminated from EDI systems.

G. EDI Risks

The greatest risk in an organization's use of EDI is <u>unauthorized access to the</u> organization's systems.

H. Comparison of EDI and E-Commerce:





III. OPPORTUNITIES FOR BUSINESS PROCESS REENGINEERING

A. Defining Business Process Reengineering

Business process reengineering (BPR) is the <u>analysis and redesign of business processes</u> and information systems to achieve significant performance improvements. BPR reduces a company to its essential business processes and reshapes organizational work practices and information flows to take advantage of technological advancements. BPR simplifies the system, makes it more effective, and improves a company's quality and service. Business process management (BPM) software has been developed to help organizations automate many BPR tasks. Reengineering typically involves the efficient and effective use of the latest information technology.

B. Challenges Faced in Business Process Reengineering

To successfully complete the BPR process, a company must overcome the following obstacles:

1. Tradition

Old ways of doing things do not die easily, especially practices associated with the organization's culture. Successful reengineering requires changes in employee culture and beliefs.

2. Resistance

<u>Change is often met with a great deal of resistance</u>. Managers must continually provide support to those affected, reassuring and persuading them that the necessary changes will work.

3. Time and Cost Requirements

BPR is costly and almost always takes two or more years to complete.

4. Lack of Management Support

Many top managers are afraid of the "big hype, few results" syndrome. Without support from top management, reengineering has little chance of succeeding.

5. **Skepticism**

Some people view BPR as traditional systems development in a new wrapper with a fancy name.

6. Retraining

Employees must be retrained, which is time-consuming and expensive.

7. Controls

Important controls that ensure system reliability and integrity cannot be deleted.

IV. BUSINESS-TO-BUSINESS (B2B)

When a <u>business sells its products or services to the public</u>, it is called a Business-to-Consumer (B2C) transaction. When a <u>business sells its products or services to other businesses</u>, it is called a Business-to-Business (B2B) transaction. When <u>consumers sell products to other consumers</u> (such as on eBay), it is called a Consumer-to-Consumer (C2C) transaction.

A. B2B E-Commerce

Many businesses buy, sell, or trade their products and services with other businesses. This usually occurs in the wholesale markets and on the supply side of commercial processes.

B. Electronic Market

It is common for B2B transactions to occur electronically via the Internet. Internet transactions can occur between businesses where there is no preexisting relationship.

C. Direct Market

It is also common for B2B transactions to occur electronically between businesses where there is a preexisting relationship. These transactions are called direct market transactions. Examples of these transactions are transactions that occur via EDI, corporate intranets, and extranets.

 $^{\circ}2C$

D. Importance of B2B

B2B commerce sites make purchasing decisions faster, simpler, safer, more reliable, and more cost effective because companies can use websites to do research and transact business with many different vendors. The following are some advantages of B2B e-commerce:

1. Speed

The faster transactions can occur between businesses, the faster the business can manufacture or resell its products to the public. B2B e-commerce allows businesses to transact with each other more rapidly than with traditional phone, fax, or mail transactions. This emphasis on speed is often called Internet time.

2. Timing

Globalization

E-commerce transactions <u>do not have to occur during normal business hours.</u>
Transactions between businesses in different countries can occur regardless of different time zones.

3. **Personalization**

Once a business registers and completes an online profile with a new business partner, it can be guided to the areas of the website in which it is most interested every time it returns to the website.

4. Security

Transactions that contain private information are <u>encrypted</u> such that if the electronic transmission is intercepted, it will be undecipherable and therefore useless to the interceptor.

5. Reliability

Because transactions occur electronically from one computer directly to another computer, the transactions should be precisely performed because generally there is no opportunity for human errors.

E. Factors to Consider

Factors for an organization to consider when deciding when and how to engage in electronic commerce are:

- 1. The selection of the business model (many electronic commerce or Internet business models are unproven).
- 2. Channel conflicts (the possibility of stealing business from existing sales or channels).
- 3. Legal issues (laws governing electronic commerce are still being developed).
- 4. Security (electronic commerce and Internet usage are vulnerable to penetration by outsiders, and security is essential).

F. Components of B2B

A reasonably simple e-commerce B2B site (on the selling side) might consist of the following elements:

- 1. The customer connecting to the site through the Internet;
- 2. The seller's site behind an enterprise firewall;
- The seller's Internet commerce center, consisting of an order entry system and a catalog system containing product descriptions and other information on what is for sale and which acts as an interface to the customer's browser;

- 4. The seller's back office system(s) for inventory management, order processing, and order fulfillment, which could include a shipping or transportation system;
- 5. The seller's back office accounting system; and
- 6. The seller's payment gateway communicating through the Internet to validate and authorize credit card transactions or other payment methods.

V. **B2B VS. B2C**

B2C is less complex than B2B because there is IT infrastructure and a supply chain on only one side of the transaction. In addition, B2B transactions often involve many more participants in each individual transaction, often involve more complex products, and normally require that order fulfillment be more certain and predictable. The payment mechanisms for B2B are much more complex than those for B2C. B2B payments may be negotiated amounts, and usually involves invoicing, whereas B2C payments are usually made immediately, at the point of sale.

Internet trading exchanges (or e-marketplaces) are aggregation points tailored to specific markets that bring buyers and sellers together to exchange goods and services. Exchanges may be managed by buyers, suppliers, distributors, or third parties called content aggregators (content aggregators pull information together from multiple websites). Digital cash (also electronic cash or e-cash) is currency in an electronic form that moves outside the normal channels of money. Digital cash can be used by people who want to make purchases over the Internet but do not want to use their credit cards. An example of digital cash is PayPal. B2C - consumer protection

VI. ENTERPRISE RESOURCE PLANNING SYSTEMS (ERP)

A. ERP Defined

An enterprise resource planning system (ERP) is a cross-functional enterprise system that integrates and automates the many business processes and systems that must work together in the manufacturing, logistics, distribution, accounting, finance, and human resource functions of a business. ERP software comprises a number of modules that can function independently or as an integrated system to allow data and information to be shared among all of the different departments and divisions of large businesses.

ERP software manages the various functions within a business (enterprise) related to manufacturing, from entering sales orders to coordinating shipping and after-sales customer service. In spite of the name, ERP normally does not offer anything in the way of planning. The enterprise part, however, is correct. ERP is often considered a back-office system, from the customer order to fulfillment of that order.

B. **ERP Functions**

ERP has many purposes and objectives. The most common are listed below:

- 1. ERP systems store information in a central repository so that data may be entered once and then accessed and used by the various departments.
- ERP systems act as the framework for integrating and improving an organization's ability
 to monitor and track sales, expenses, customer service, distribution, and many other
 business functions.
- ★ 3. ERP systems can provide <u>vital cross-functional information</u> quickly to managers across the organization in order to <u>assist them in the decision-making process.</u>

EIS

VII. SUPPLY CHAIN MANAGEMENT SYSTEMS (SCM)

A. Supply Chain Management Defined

Supply chain management (SCM) is concerned with the four important characteristics of every sale: what, when, where, and how much. For example, all customers, whether business or consumer, expect the following:

- 1. The goods received should match the goods ordered; What
- 2. The goods should be delivered on or before the date promised; When
- 3. The goods should be delivered to the location requested; and Where
- 4. The cost of the goods should be as low as possible. How much

Supply chain management is the integration of business processes from the original supplier to the customer and includes purchasing, materials handling, production planning and control, logistics and warehousing, inventory control, and product distribution and delivery. SCM systems may perform some or all of these functions.

B. Reengineering of Supply Chains

Companies reengineer their supply chains to increase efficiency, reduce costs, and ultimately meet the customers' needs. SCM software can help the various parties coordinate more efficiently.

SCM Objectives

1. Achieve Flexibility and Responsiveness

The overall objectives of SCM are achieving flexibility and responsiveness in meeting the demands of customers and business partners. SCM might incorporate the following functions:

- a. Planning (e.g., demand forecasting, product pricing, and inventory management)
- b. <u>Sourcing</u> (e.g., procurement and credit and collections)
- c. Making (e.g., product design, production scheduling, and facility management)
- d. Delivery (e.g., order management and delivery scheduling)

2. Supply Chain Planning Software

Each of the functions of SCM comprises dozens of specific steps, many of which have their own specific software. Supply chain planning software is utilized to improve the flow and efficiency of the supply chain and reduce inventory. Supply chain execution software automates the various steps of the supply chain.

3. Often Termed an Extension of ERP

SCM is often defined as an extended ERP system that goes outside the enterprise and addresses the entire supply chain (i.e., additional modules exist that extend outside the organization itself). Much of the information used by an SCM system resides in ERP systems. However, because the system does extend beyond the company, it is even more complex than ERP.

VIII. CUSTOMER RELATIONSHIP MANAGEMENT SYSTEMS (CRM)

A. Customer Relationship Management Defined

Customer relationship management systems (CRM) provide sales force automation and customer services in an attempt to manage customer relationships. CRM systems record and manage customer contacts, manage salespeople, forecast sales, manage sales leads, provide and manage online quotes and product specifications and pricing, and analyze sales data.

B. CRM Objectives

The objective of CRM (and of CRM systems) is to increase customer satisfaction and thus increase revenue and profitability. CRM attempts to do this by appearing to market to each customer individually. The assumptions are that 20 percent of customers generate 80 percent of sales and that it is 5 to 10 times more expensive to acquire a new customer than to obtain repeat business from an existing customer. CRM also attempts to reduce sales costs and customer support costs. It attempts to identify the best customers and possibly provide those best customers with increased levels of service or simply drop the worst customers.

C. Categories of CRM

CRM is sometimes divided into two categories:

1. Analytical CRM

An *analytical CRM* creates and exploits knowledge of a company's current and future customers to drive business decisions.

2. Operational CRM

An operational CRM is the automation of customer contacts or contact points.

IX. OTHER E-COMMERCE TECHNOLOGIES

A. Electronic Funds Transfer(s)

Electronic funds transfer systems (EFT) are a form of electronic payment for banking and retailing industries. EFT uses a variety of technologies to transact, process, and verify money transfers and credits between banks, businesses, and consumers. The Federal Reserve Fedwire system (Automated Clearing House Network) is used frequently in EFT to reduce the time and expense required to process checks and credit transactions.

1. Third-Party Vendor

EFT service is often provided by a *third-party vendor* who acts as the intermediary between the company and the banking system. That third party might accept transactions from a business and perform all of the translation services.

2. Data Encryption

Insured and bonded

EFT security is provided through various types of data encryption.

3. Reduction in Errors

EFT reduces the need for manual data entry, thus reducing the occurrence of data entry errors.

B. Application Service Providers (ASP)

Application service providers provide access to application programs on a rental basis. They allow smaller companies to avoid the extremely high cost of owning and maintaining today's application systems by allowing them to pay only for what is used. The ASPs own and host the software and users access it via a web browser. The ASP is responsible for software updates and usually will also provide backup services for the users' data.

1. Advantages of ASP

The benefits of utilizing an ASP are lower costs, both from a hardware, software, and people standpoint, and greater flexibility. Small businesses especially benefit because they do not need to hire systems experts to provide the services performed by the ASP.

2. <u>Disadvantages</u> of ASP

The drawbacks of utilizing an ASP are the possible risks to the security and privacy of the organization's data, the financial viability or lack thereof of the ASP, and possible poor support by the ASP (a concern anytime anything is outsourced).

3. Concepts Similar to ASP

- IBM offers a similar concept in its utility computing and e-commerce on demand strategies.
- b. ASPs are similar to the timesharing providers or service bureaus of the past that rented raw computing power (time on computers) to customers, except that ASPs rent applications instead of just the computer processing.
- Related to ASPs are present-day service bureaus, which perform processing outside the organization (e.g., for payroll and other human resources functions).

X. EFFECTS OF INTERNET EVOLUTION ON BUSINESS OPERATIONS AND ORGANIZATION CULTURES

Advances in technology have created an extremely robust relationship between technological advancements and business opportunities.

A. Web 2.0 Interaction

Web 2.0 emerging technologies have had a considerable impact on e-commerce. In its early years, the Internet was mostly a repository of documents that Web surfers could browse. Technology advances led to the development of "Web 2.0," in which Web surfers began to interact with websites.

1. Collaborative Websites and Social Networking

Web 2.0 led to the emergence of the wiki, a type of collaborative website in which users not only browse content, but also add and modify content. Wikis have been popularized by Wikipedia (www.wikipedia.com), a tremendously popular Web-based encyclopedia that contains millions of articles contributed by people all over the world. Other well-known websites that have helped to popularize Web collaboration include Facebook and Blackboard Collaborate.

2. Dynamic Content

Web 2.0 is associated with an increase in Web pages with *dynamic content*. Such content is often linked to databases, such as price lists and catalog product lists. Such data can be dynamically embedded in Web pages through XML, with the data stored in a database separate from the Web page. Dynamic content is any content that changes frequently and can include video, audio and animation.

B. Mash-ups

Mash-ups are Web pages that are collages of other Web pages and other information. Google maps (maps.google.com) is an example of a mash-up. Google Maps allows the user to view various sources of information (e.g., places of interest and street names) superimposed on a single map.

C. Web Stores

1. Stand-alone Web Stores

Many small companies have stand-alone Web stores that are not integrated with larger accounting systems. Such stores are typically hosted by shopping cart software that manages a product catalog, user registrations, orders, e-mail confirmations, and so on. Financial reports, such as order summaries, are generated as needed by the software. The reports are then imported into general accounting software.

2. Integrated Web Stores

Many larger companies and an increasing number of small companies have turned to ERP systems that integrate all the major accounting functions, as well as the Web store, into a single software system. Such systems process Web orders and then automatically update cash and revenue accounts, handle inventory reordering, and so on. In effect, such systems treat Web store sales the same as sales made in retail stores.

D. Cloud Computing

Cloud computing is defined as virtual servers available over the Internet. Cloud computing includes any subscription-based or pay-per-use service that extends an entity's existing information technology capabilities on a real-time basis over the Internet. A public cloud sells services to anyone on the Internet. A private cloud is a private network or data center that provides services to a limited number of customers.

Cloud computing can offer the advantage of professional management of hardware and software. Cloud providers will generally have sophisticated backup procedures as well as high level security for customer data.

Cloud computing services can be divided into three categories:

1. Infrastructure-as-a-Service (laaS)

Infrastructure-as-a-Service, also known as Hardware-as-a-Service (HaaS), outsources storage, hardware, services, and networking components to customers, generally on a per-use basis.

2. Platform-as-a-Service (PaaS)

Platform-as-a-Service allows customers to rent virtual servers and related services that can be used to develop and test new software applications.

3. Software-as-a-Service (SaaS)

Software-as-a-Service is a method of software distribution in which applications are hosted by a vendor or service provider and made available to customers over the Internet. This is another name for the ASP (application service provider).

XI. VARIOUS DEFINITIONS

Certain definitions are foundational to your understanding of contemporary Web-based IT operations and have been included below as supplementary information.

A. Hypertext Markup Language (HTML)

Hypertext markup language (HTML) is a tag-based formatting language used for Web pages. It provides a means to describe the structure of text-based information in a document and to replicate that information in a Web page by using the tags in the text.

B. Hypertext Transfer Protocol (HTTP)

Hypertext transfer protocol (HTTP) is the communications protocol used to transfer Web pages on the World Wide Web. HTTPS is the secure version of HTTP that uses SSL (secure socket layer) for its security.

C. J URL

The technical name for a Web address is a <u>uniform resource locator</u> (URL), which consistently directs the user to a specific location on the Web. Web addresses include the following (many Web addresses are considerably more complex than this example):

- 1. <u>Transfer protocol</u>, such as http:// (Hypertext Transfer Protocol) or ftp:// (File Transfer Protocol)
- 2. <u>Server</u>, such as <u>www</u> (indicates a Web server)
- 3. <u>Domain name</u>, such as Becker (Becker is the subdomain name and becker.com is the full domain name)
- 4. <u>Top-level domain</u>, such as .com, .net, .edu (often called generic top-level domains)
- 5. Country, such as .US, .DE, .FR, .IT (often called country code top-level domains)
- 6. Example: http://www.becker.com.us (the .us is not really needed)

D. Transport Control Protocol (*TCP*)

Transport control protocol (TCP) is the transmission protocol of the Internet protocol suite. TCP is a transport layer protocol. TCP is a reliable and a connection-oriented protocol. (A protocol is the set of rules required for electronic communications to take place.)

E. Domain Name

A domain name is a name that includes one or more Internet protocol (IP) addresses (a numerical label assigned to each device in a network). In a Web address such as www.becker. com, the domain name is becker.com. The .com is the top-level domain name for commercial organizations. Other such top-level domain names are .gov for governments, .edu for educational institutions, .org for nonprofit organizations, and .mil for the military. The Becker is the second-level domain name, and the www indicates that the computer with that address is a Web server. Organizations with second-level domain names have to have a DNS server (see below). A third-level domain name is an individual host and would be something like olinto. becker.com if a host were named for Peter Olinto. The entire address is called a fully qualified domain name. If the name had /students attached to it, as in www.becker.com/students, the /students (and anything after it in more complex domain names) would be a file name. A DNS root server is the server that administers the top-level domain names.

F. Domain Name System (DNS)

The domain name system (DNS) is the system of domain names that is employed by the Internet. The Internet is based on IP addresses, not domain names, and each Web server requires a domain name server to translate domain names into IP addresses. Think of domain name servers as large electronic telephone books.

G. Domain Name Warehousing

Domain name warehousing is the practice of obtaining control of domain names with the intent of warehousing (owning them without using them). Companies may do this to prevent others from acquiring domain names similar to theirs and directing traffic away from their legitimate web site. Companies can obtain domains that are common misspellings or typographical errors of their name and then link those domains to the correct site.

H. Web Server

A *Web server* is a computer that delivers a Web page upon request. Every Web server has an IP address. Any computer can be turned into a Web server by installing Web server software and connecting it to the Internet.

I. Web Hosting Service

A Web hosting service is an organization that maintains a number of Web servers and provides fee-paying customers with the space to maintain their websites.

J. Wi-Fi

Wi-Fi is the set of standards for wireless local area networks (LANs.) The Wi-Fi Alliance is a global nonprofit organization created in 1999 with the goal of driving the adoption of a single worldwide accepted standard for high-speed wireless LANs.

K. Web services

Web services are an Internet protocol for transporting data between different applications within a company's boundaries or across companies. XML may be used with Web services to produce automated information exchange between computers and software and to automate business reporting processes.

TYPES OF INFORMATION SYSTEMS AND TECHNOLOGY RISKS

I. RISK EVENT IDENTIFICATION

Listed below are the four main risks with respect to systems:

A. Strategic Risk

Strategic risk includes the risk of choosing inappropriate technology. For example, an organization may choose a Web-based program to share data between remote offices in different cities. If one of the offices does not have a high-speed Internet connection and cannot enter data at the same speed as the other offices, this problem may lead to the generation of reports thought to be up-to-date but actually missing data from the office with the slow Internet connection.

B. Operating Risk

Operating risk includes the risk of doing the right things in the wrong way. For example, assume a payroll manager is supposed to run the biweekly payroll after the human resources manager enters newly-hired employees into the system. If the payroll manager runs the payroll too early (i.e., before the newly-hired employees are entered), the newly-hired employees do not get paid, and the payroll report is inaccurate.

C. Financial Risk

Financial risk includes the risk of having financial resources lost, wasted, or stolen. For example, an inventory report lists several laptop computers, but some of the laptops were not returned when employees left the organization. This problem could lead to inaccurate financial reports that report assets that no longer exist.

D. Information Risk

Information risk includes the risk of loss of data integrity, incomplete transactions, or hackers. If a network system that is connected to the Internet does not have a secure firewall (a protective hardware or software device that prohibits unauthorized entry) or another type of security measure, hackers may enter the system and corrupt or destroy data.

E. Specific Risks

Risks can be divided into the categories of errors, intentional acts, and disasters.

1. Errors - Unintentional

Errors are mistakes on the part of employees utilizing the systems (e.g., carelessness, failure to follow directions, or ignorance due to poor training), lost or misplaced data (e.g., transactions are misplaced and are never entered), application or system software problems, temporary equipment problems, data transmission errors, and computer equipment lost or stolen.

2. Intentional Acts

Intentional acts might be <u>sabotage</u>, <u>embezzlements</u>, <u>viruses</u>, <u>denial of service attacks</u>, and other types of computer fraud.

3. Disasters

Disasters could include fires, floods, earthquakes, high winds, terrorism, and war.

II. THREATS IN A COMPUTERIZED ENVIRONMENT

A. Virus

A *virus* is a piece of a computer program that inserts itself into some other program, including operating systems, to propagate and cause harm to files and programs. It requires a host program to propagate and cannot run independently.

B. Worm

A *worm* is a program (and a special type of virus) that can run independently and normally propagates itself over a network. It cannot attach itself to other programs.

C. Trojan Horse

A *Trojan horse* is a program that appears to have a useful function but contains a hidden and unintended function that presents a security risk. A Trojan horse normally does not replicate itself.

D. Denial-of-Service Attack

In a *denial-of-service attack*, one computer or group of computers bombards another computer with a flood of network traffic. For example, someone could program many computers (zombies) to simultaneously send requests to access a company's web site. The volume is so high that the web server system crashes. It often takes hours or even days to recover from a denial-of-service attack.

E. Phishing

Phishing is the sending of phony e-mails to try to lure people to phony websites where they are asked for information that will allow the phisher to impersonate the user. Phishing e-mails can be made to closely mimic legitimate company e-mails. However, companies do not request "confirmation" of usernames, passwords, account numbers, and other information via e-mail. Users should be informed to go directly to the company website to determine any changes or find information related to accounts.

III. RISK ASSESSMENT AND CONTROL ACTIVITIES

A. Definitions

1. Risk

In general, a *risk* is the possibility of harm or loss.

2. Threat

A *threat* is any eventuality that represents a danger to an asset or a capability linked to hostile intent.

3. Vulnerability

For business information systems, *vulnerability* is a <u>characteristic of a design</u>, implementation, or operation that renders the system <u>susceptible to a threat</u>.

4. Safeguards and Controls

Safeguards and controls are policies and procedures that, when effectively applied, reduce or minimize vulnerabilities.

B. Risk Assessment

Before risks can be managed, they must be assessed. The steps in risk assessment are to identify threats, to evaluate the probability that the threat will occur, to evaluate the exposure in terms of potential loss from each threat, to identify the controls that could guard against the threats, to evaluate the costs and benefits of implementing controls, and to implement controls that are determined to be cost effective.

C. Evaluation and Types of Controls

Controls are always evaluated on a cost/benefit basis. The *access controls* and *data* and *procedural controls* discussed below are important tools of risk management, as is disaster recovery.

IV. ACCESS CONTROLS

Access controls limit access to program documentation, data files, programs, and computer hardware to those who require it in the performance of their job responsibilities. These controls include multilevel security, user identification (user names), user authorization (passwords), limited access rooms, callbacks on dial-up systems, and the use of file-level access attributes and firewalls.

A. Physical Access

Physical access to computer rooms should be limited to the computer operators and other personnel of the IT department. Restricted access can be accomplished through locked computer rooms requiring specially coded ID cards or keys for entry. Manual key locks on the equipment, if utilized, can provide additional security. Note, however, that ID cards can be lost or stolen.

B. Electronic Access

Unauthorized access to data and application programs is a major concern. With the advent of numerous computer-based fraud schemes, more attention is being given to data access. Such data access controls include:

1. User Identification Codes

User identification codes (user IDs) coupled with regularly changed passwords are common access controls. In addition, application systems normally have master passwords that are set by the vendor. Such passwords should be changed when the system is installed. Programmers will sometimes install *backdoors*, a means of access to a program or system that bypasses normal security mechanisms so that the program or system can be easily accessed for troubleshooting or other purposes. Backdoors should be eliminated.

Other security steps are:

- a. to disconnect a hardware device and deactivate the user ID when some small number of consecutive failed attempts to access the system occurs.
- b. to require that all hardware devices be logged off when not in use or automatically log them off when they are inactive for a certain amount of time.
- c. utilize password scanning programs that look for weak or easily guessed passwords.
- d. require dual authentication. For example, when the user logs in using a correct password, the system will send a text message to the user's cell phone. That password must be entered to access the system. This process prevents access by someone who has acquired a username and password but is not the legitimate user.

2. File-Level Access Attributes

File-level access attributes control the privileges a particular user has to a file. Read-only access/privileges means that data can be read but cannot be changed. Write access/privileges means that data can be read or changed. Execute access/privileges grant the ability to execute a program. The user name used to access the file will determine the type of access granted.

3. Assignment and Maintenance of Security Levels

Assignment and maintenance of security levels that restrict functions and program accessibility are common access controls.

EXAMPLE

There might be general user IDs and passwords to obtain access to a human resources system (for employee access to their personal data) and additional security and or restrictions to obtain access to payroll data (only for selected human resources personnel who maintain that payroll data). Passwords for the various levels of security might be granted by different parts of the organization. In the payroll example, the generic user IDs and passwords might be provided to employees by the IT security department, and passwords for access to the payroll data might be provided by the manager of the human resources department.

4. Callbacks on Dial-up Systems

For systems that allow users to access files from remote terminals, system security might require the system to automatically look up the phone number of an authorized user and call that user back before access is allowed. The initial caller would enter a user ID and password, and the system would call back the supposedly authorized caller at the phone number from which the caller was authorized to call. As fewer users are accessing networks via phone lines, this system is less common than in the past.

5. File Attributes

File attributes are set to restrict writing, reading, and/or directory privileges for a file. File attributes are extremely basic, almost primitive, security mechanisms. The same can be said for external and internal labels on magnetic tape volumes and file protection rings, which are physical plastic rings that are manually inserted in magnetic tapes before anything can be written onto the tape.

6. Firewalls

A *firewall* is a system, often both hardware and software, of user identification and authentication that prevents unauthorized users from gaining access to network resources. A firewall acts as a gatekeeper by isolating a private network from a public network. The term firewall may also be applied to a network node used to improve network traffic and to set up a boundary that prevents traffic from one network segment from crossing over to another. A single company may use multiple firewalls throughout its network.

a. Firewalls Deter

Access rules for firewalls have to be established and maintained. Firewalls can deter, but cannot completely prevent, intrusion from outsiders. Firewalls do not prevent or protect against viruses.

b. Network Firewalls

Traditionally, firewalls have been network firewalls that have <u>protected the network</u> <u>as a whole</u>.

c. **Application Firewalls**

An *application firewall* is designed to <u>protect specific application services</u> from attack.

d. Firewall Methodologies

Firewall methodologies can be divided into several different categories, and they can be used individually or combined in a specific product.

(1) Packet Filtering

Packet filtering examines packets of data as they pass through the firewall according to the rules that have been established for the source of the data, the destination of the data, and the network ports the data was sent from. Packet filtering is the simplest type of firewall configuration, but it can be circumvented by an intruder who forges an acceptable address (called IP spoofing).

(2) Circuit Level Gateways

Circuit level gateways allow data into a network only when computers inside the network request the data.

(3) Application Level Gateways

Application level gateways (also known as proxies) examine data coming into the gateway in a more sophisticated fashion. Proxies are more secure, but they also can be slow.

EXAMPLE

An application level gateway can be used to control which computers in a network can access the Internet and also which Internet pages they are allowed to view (access to certain websites may not be allowed).

DISASTER RECOVERY AND BUSINESS CONTINUITY

I. ALTERNATIVE PROCESSING FACILITIES

A. Disaster Recovery

Disaster recovery consists of an entity's plans for restoring and continuing operations in the event of the destruction of program and data files, as well as processing capability.

Short-term problems or outages do not normally constitute disasters. If processing can be quickly reestablished at the original processing location, then disaster recovery is not necessary. If processing cannot be quickly reestablished at the original processing site (possibly because the original processing site no longer exists), then disaster recovery is necessary.

1. Major Players in Disaster Recovery

Major players in a disaster recovery plan are the <u>organization</u> itself and the <u>disaster</u> recovery services provider (e.g., IBM or SunGard).

If application software packages are utilized, the <u>package vendors</u> may be involved. For distributed processing, <u>hardware vendors</u> may be involved. Senior management support is absolutely necessary for an effective disaster recovery plan.

★ 2. Steps in Disaster Recovery





The steps in a disaster recovery plan are to assess the risks, identify mission-critical applications and data, develop a plan for handling the mission-critical applications, determine the responsibilities of the personnel involved in disaster recovery, and test the disaster recovery plan. Depending upon the organization, the disaster recovery plan may be limited to the restoration of IT processing or may extend to restoration of functions in end-user areas (often called business continuity). One factor that must be considered in business continuity is the paper records that might normally be maintained in end-user areas and that might be lost in a disaster.

3. Advantages and Disadvantages of Disaster Recovery and Business Continuity

If an organization does not have a disaster recovery and business continuity plan and a disaster occurs, the organization may be out of business. The disadvantage is the cost and effort required to establish and maintain a disaster recovery plan.

4. Split Mirror Backup

As the amount of data needed to support many large companies grows, so do the time and resources that it takes those companies to backup and recover their data. One effective backup method that is often used is known as split mirror backup. This method can be used to quickly backup large amounts of data to a remote location in the event of a disaster.

B. Types of Disaster Recovery

1. Use of a Disaster Recovery Service

Some organizations contract with outside providers for disaster recovery services. Various levels and types of service can be provided, <u>ranging from an empty room to complete facilities across the country where end users can be located</u>. The major emphasis is on hardware and telecommunications services.

NYSE

2. Internal Disaster Recovery

Some organizations with the requirement for instantaneous resumption of processing after a disaster (e.g., banks and brokerage houses) provide their own duplicate facilities in separate locations. Data might be mirrored (i.e., updated and stored in both locations), and processing can be switched almost instantaneously from one location to the other. Duplicate data center and data mirroring is expensive, and most organizations adopt cheaper solutions.

3. Multiple Data Center Backups

Some organizations with multiple data centers plan to use one data center to back up another, assuming that there is enough capacity to process the essential applications.

Organizations also must decide what types of backups to perform in order to recover lost data.

Longest

- a. <u>Full backup</u> is an exact copy of the entire database. Full backups are time-consuming, so most organizations only do full backups weekly and supplement them with daily partial backups.
- b. Two types of partial backups are possible:

Shortest (1)

(1) An incremental backup involves copying only the data items that have changed since the last backup. This produces a set of incremental backup files, each containing the results of one day's transactions. Restoration involves first loading the last full backup and then installing each subsequent incremental backup in the proper sequence.

Middle (2)

A differential backup copies all changes made since the last full backup. Thus, each new differential backup file contains the cumulative effects of all activity since the last full backup. Consequently, except for the first day following a full backup, daily differential backups take longer than incremental backups. Restoration is simpler, however, because the last full backup needs to be supplemented with only the most recent differential backup, instead of a set of daily incremental backup files. Many organizations make incremental and differential backups daily.

II. TYPES OF OFF-SITE LOCATIONS How fast?

A. Cold Site |-3 days

A *cold site* is an <u>off-site</u> location that has all the electrical connections and other physical requirements for data processing, but it does not have the actual equipment. Cold sites usually require one to three days to be made operational because equipment has to be acquired. Organizations that utilize a cold site approach normally utilize generic hardware that can be readily (and quickly) obtained from hardware vendors. Cold sites are the cheapest form of off-site location.

B. Hot Site - Few hours

A hot site is an off-site location that is equipped to take over the company's data processing. Backup copies of essential data files and programs may also be maintained at the location or a nearby data storage facility. In the event of a disaster, the organization's personnel need to be shipped to the disaster recovery facility to load the backup data onto the standby equipment.

1. Telecommunications Network

The most difficult aspect of recovery is often the telecommunications network.

2. Floor Space and Equipment Determination

Disaster recovery service providers normally have an extensive amount of floor space and an extensive amount of equipment, but nowhere near enough if all customers (or even a significant number of similar customers) declare a disaster at the same time. How much is needed is determined on a probabilistic basis; to the disaster recovery services provider, geographic and industry diversification of customers is extremely important.

3. Personnel Issues

Effective recovery, and especially rapid effective recovery, is often a function of having knowledgeable personnel involved.

C. <u>Warm Site</u> Compromise: ½ day-| day

A *warm backup* site is a <u>facility that is already stocked with all the hardware that it takes to create a reasonable facsimile of the primary data center.</u>

In order to restore the organization's service, the latest backups must be retrieved and delivered to the backup site. Next, a bare-metal restoration of the underlying operating system and network must be completed before recovery work can be done. The advantage of the warm backup site is that a restoration can be accomplished in a reasonable amount of time. The disadvantage is that there is still a continued cost associated with the warm backup site because a contract must be maintained with the facility to keep it up-to-date. The warm backup site is the compromise between the hot backup site and the cold backup site.

APPENDIX

IT Fundamentals

I. IT FUNDAMENTALS

The following *IT fundamentals* should be considered when performing an organizational needs assessment (see Topic 1). Most of these terms are basic and should be quickly reviewed. Time should be spent studying the less familiar and more complex topics listed below.

A. Components of Computerized Systems

Most organizations depend on some kind of computer technology to process their transactions and maintain their records. As mentioned on the first page of the information technology material, five main components of information technology exist: people, data, hardware, software, and networks. People and data have already been discussed. The next three areas (hardware, software and networks) will be discussed in more detail in the following sections.

B. Hardware

1. Central Processing Unit

The central processing unit (CPU) is the control center of the computer system. Its principal components are:

a. Processor

The *processor* interprets program instructions; coordinates input, output, and storage devices (the control unit); and performs arithmetic calculations (the arithmetic logic unit).

b. Primary Storage

Primary storage (main memory) is used to store program instructions and data until the program instructions can be executed. For personal computers, primary storage is further divided into random access memory (RAM), which stores data temporarily while it is being processed, and read-only memory (ROM), which is used to permanently store data needed to power the computer.

Virtual memory is not real memory. Portions of a program that are not being executed are stored on disk as virtual memory pages and are retrieved and brought into actual physical memory when they are needed.

2. Secondary Storage Devices

Secondary storage devices (e.g., hard drives or magnetic disks, flash drives, CD-ROM discs, optical discs, and magnetic tape) are a means to permanently store programs and data. With random storage devices, data is accessed randomly. With sequential storage devices (such as tapes), data is accessed sequentially, which is faster.

Currently, what is called RAID (Redundant Array of Independent Disks) is often used for disk storage. The basic idea of RAID is to combine multiple inexpensive disk drives into an array of disk drives to obtain performance, capacity and reliability that exceed that of a single large disk drive.

RAID can be implemented in hardware, in software, or a combination of both, although hardware implementations provide better performance

3. Peripherals

Peripherals are devices that transfer data to or from the CPU but that do not take part in the actual processing of the data. Peripherals include input devices and output devices.

a. Input Devices

Input devices supply the data to be processed. Examples of common input devices are keyboards, mice, scanners, magnetic ink character readers (MICR), touch sensitive screens, and microphones.

b. Output Devices

Output devices transfer data from the processing unit to various output media. Examples of common output devices are printers, speakers, cathode ray tubes (CRTs or monitors), and plotters (graphics printers). Many hardware devices, of course, can act as both input and output devices.

4. Classes of Processors

Classes of processors (in terms of overall processing power) normally found in business environments are mainframes, midrange and minicomputers, and personal computers. Supercomputers are also sometimes used for specialized processing. Mainframes include specialized processors to handle certain specialized functions such as input, output, and telecommunications, which tend to be relatively slow.

a. Processing Power

Processing power is often described in terms of MIPS (millions of instructions per second). However, many other factors determine the overall processing power of a computer system besides the power of the processor. For many applications, the speed of the input and output devices can be just as important.

b. Multiprocessing

Multiprocessing is the coordinated processing of programs by more than one processor. Multiprocessing is a general term that is divided into symmetric multiprocessing (in which one operating system controls the processing) and parallel processing (in which each processor has its own operating system). Multiprogramming is several parts of a program running at the same time on a single processor. Parallel processing is the simultaneous use of more than one computer to execute a program, which first has to be divided into parts that can be executed separately.

C. Software

As mentioned previously, *software* can be divided into three broad categories of system software, programming languages, and application software.

1. System Software

System software consists of the programs that run the computer and support system management operations.

a. Operating System

An *operating system* provides the interface between the user and the hardware. It defines what commands can be issued and how they are issued (e.g., typing in a command, pointing at an icon and clicking, issuing a verbal command, etc.). The operating system also controls all input and output to main memory, and it may include certain utility programs that might be used stand-alone or in application software.

The operating systems that most people are familiar with are the various versions of Microsoft Windows® for PCs. Other operating systems are the various IBM operating systems for mainframes, the various brands of UNIX for smaller midrange processors (each vendor has its own name for its brand of UNIX, which are all a little bit different), and Linux.

Linux is a public domain open source (and thus a somewhat free) UNIX-based operating system for PCs that was developed in 1991 by a Finn named Linux Torvalds. Linux is becoming more popular as an alternative to Microsoft, especially for servers. The reasons for the popularity of Linux is that it is cheap, it is outside the control of Microsoft and its licensing practices, it is stable, and it is apparently not as vulnerable to security problems as are the various Microsoft operating systems. The use of Linux does introduce a new operating system that needs to be supported.

b. Database Management System (DBMS)

In organizations that employ mainframe and midrange computer systems, a database management system is an important software package because it controls the development, use, and maintenance of the databases used by the organization. Quite often, the terms database and DBMS are used interchangeably. This usage is inaccurate. It is important to understand what each term means.

(1) Definitions

(a) Data Storage Definitions

(i) Bit

A bit is a binary digit (0 or 1) with which all computer data is stored.

(ii) Byte

A *byte* is a group of normally 8 bits that can represent a number or a letter, with the specific form dependent on what internal representation format is being used. Sometimes, bytes are called characters.

```
1 Kilobyte = 1KB = 1,000 bytes
1 Megabyte = 1MB = 1 million bytes
1 Gigabyte = 1GB = 1 billion bytes
1 Terabyte = 1TB = 1 trillion bytes
```

(iii) Field

A *field* is a group of bytes in which a specific data element such as an employee number or name is stored.

(iv) Record

A *record* is a group of fields that represents the data that is being stored for a particular entity such as a customer or an account receivable.

(v) File

A *file* is a collection of related records, often arranged in some kind of sequence, such as a customer file made up of customer records and organized by customer number.

(b) Traditional File Storage

Traditionally, data was stored in files, with the formats and organization of the data often specific to each particular application system. As a result, what was supposedly the same data was often stored in multiple files, often with different names and different formats, almost always resulting in different values for the same data. In addition, if the size or the format of a data element changed, the programs utilizing that data element often had to be changed (called program-data dependence). Databases address this issue.

(c) Database

A *database* is an integrated collection of data records and data files. It comprises nothing more than stored data. A database most often centralizes data and minimizes redundant data (think of the data as all being in one place, although it may or may not be physically stored that way). The structure of the data in the database often provides the data relationships that start to change the data into information.

(d) Database Management System

A DBMS is not a database; it is a tool. A DBMS is a separate computer program that allows an organization to create new databases and use and work with the data in the databases after they have been created. It also allows for maintenance to be performed on a database after it has been placed into operation. Database maintenance may include the addition or subtraction of data elements or changes to the structure of the database itself.

A database management system normally includes a data dictionary or data repository, in which each individual data element in the databases is defined. Common database management systems are Microsoft Access® for PCs and Oracle®.

(e) Relational Technology

Early databases organized records in hierarchies or trees (like an organization chart) implemented by indexes and linked lists.

Today, most successful databases are relational, meaning the data is stored in two-dimensional tables that are "related" to each other via keys. The initial relational database management systems were often slower than their hierarchical predecessors, but made up for it with ease of definition and access. Relational databases often include ad hoc report writers.

Normalization is the process of separating data into logical tables. Often, a process of data modeling is used. Before a relational database can be designed, a process of normalization has to occur.

(f) Object-Oriented Databases

A newer type of database is an *object-oriented database*. Conventional databases, both relational and non-relational, are designed for homogeneous data that can be structured into predefined data fields and records organized (in the case of relational databases) in rows and tables. Data such as comments, drawings, images, voice, and video do not fit into this definition.

Object-oriented databases store such data. Of course, because it is more flexible, an object-oriented database can be even slower than a relational database.

(2) Major Uses of a DBMS

Listed below are the four main functions of a DBMS.

(a) Database Development

Database development is the procedure by which a database administrator uses the DBMS to create a new, empty database. Once a database has been created (the data elements and the structure of the database are defined), data can be imported into the database by the DBA from other sources such as traditional files (called conversion or data conversion) or input by end users.

(b) Database Query

Database query is the process by which end users can retrieve specific data or information from the database. Constructing a query is often a simple procedure, in which an end user establishes certain criteria and all data that match the criteria are displayed on the computer screen or in a printable report. The end user often must have some basic knowledge of the DBMS or database structure in order to construct an efficient query. Poorly written queries can be hazardous to the performance of a DBMS. Monitoring database usage and hopefully discovering poorly written queries is often an important function of a DBA.

Database query is most often provided in a relational database by a language called SQL (structured query language). SQL provides the ability to "select" data from individual tables in a database based on the data satisfying certain conditions (customers who had ordered more than a certain amount in a certain period) and to "join" certain tables such as suppliers and part numbers, etc. SQL consists of a data definition language (DDL), which is used to define the database, and a data control language (DCL).

(c) Database Maintenance

Database maintenance is the updating of the DBMS software and the revision of the database structure to reflect new business needs.

It includes testing the effectiveness and efficiency of the database, which is normally done via built-in diagnostic and maintenance programs. This function is called *database tuning*. A database is running effectively if it is accurately recording data. It is running efficiently if it is operating fast enough.

(d) Application Development

A DBMS allows a DBA or a computer programmer to use a programming language or a series of macros to "turn a database into a computer software application." (A *macro* is a series of prerecorded commands that will be executed on the occurrence of certain events.) Rather than having to teach end users how to create queries or reports using the DBMS, the database can be automated and converted into an application made up of user-friendly screens and forms that anyone can use.

(3) Types of Databases

A database is a structure that can house information about multiple types of entities and the relationship(s) among those entities. Types of databases include:

(a) Operational Databases

Operational databases store detailed data needed to support the day-today operations of an organization. Examples of operational databases are customer databases and personnel databases.

(b) Analytical Databases

Analytical databases store data and information extracted from operational databases. These databases consist of summarized data used primarily by managers in an organization.

(c) Data Warehouses

Data warehouses store data from current and previous years, often from both operational and analytical databases. A major use of data warehouses is in data mining, where the data (often a large amount of diverse data) is processed to identify trends, patterns, and relationships. Sometimes, a limited scope data warehouse is called a data mart. Data warehouses often use a structure other than a relational database. The goal of the data warehouse is not transaction processing, so other structures that allow redundant data can be more efficient for the data mining process. Since the data is generally imported from other databases rather than input directly in the data warehouse database, this redundancy is not likely to lead to data inconsistencies due to input errors.

(d) Distributed Databases

Distributed databases are physically distributed in some manner on different pieces of local or remote hardware. Depending on the specific circumstances, certain data might be replicated (i.e., stored in multiple locations), and other data might be distinct and stored only in one location.

(e) End-User Databases

End-user databases are developed by end users at their workstations. For example, e-mail, downloads from the Internet, and documents generated through word processing might be stored in end-user databases. In addition, end users might develop their own small applications using simple databases.

(4) Advantages of a DBMS

(a) Reduction of Data Redundancy and Inconsistency

Data redundancy and inconsistency are reduced, so that data is entered only once and stored at only one location.

(b) Potential for Data Sharing

There is the *potential for data sharing* so that existing and newer applications can share the same data.

(c) Data Independence

There is *data independence*, in which the definition of the data and the data itself are separate from the programs that use the data, so that data storage structures or access strategies in the database can change without affecting the data itself and without affecting the programs that process that data. The DBMS provides the interface that allows applications to access the data without knowing exactly where the data resides.

(d) Data Standardization

There is data standardization, which facilitates data interchange between systems.

(e) Improved Data Security

Data security is improved. Most database management systems have their own security systems, which might supplement external security systems.

(f) Expanded Data Fields

Data fields can be expanded without adverse effects on application programs. This is another aspect of data independence.

(g) Enhanced Information Timeliness, Effectiveness, and Availability

Timeliness, effectiveness, and availability of information are normally increased or enhanced.

(5) Disadvantages of a DBMS

(a) Cost

Costs include the purchase of the DBMS itself and the conversion to it.

(b) Highly Trained Personnel Are Necessary

A DBMS requires highly trained personnel. The DBA is a technical position, normally requiring a considerable amount of training and experience in the specific DBMS being utilized.

(c) Increased Chances of Breakdowns

With a common integrated database, there are increased repercussions of hardware or software breakdowns. Specific precautions must be taken to replicate part or all of the data.

(d) Possible Obscuring of the Audit Trail

The audit trail may be obscured as a result of data movement from one file to another.

(e) Specialized Backup and Recovery Procedures Required

Specialized backup and recovery procedures are necessary, especially if the databases are distributed or replicated.

(6) Referential Integrity

In a relational database, *referential integrity* prevents the deleting of key values in related records (tables). Assume there is a relational database with customer records (tables) and invoice records (tables). The invoice records will normally contain a customer number to reference back to the customer record. Referential integrity in the DBMS prevents the customer records from being deleted and destroying the relationship to the invoices.

2. Programming Languages

Programming languages like COBOL, Pascal, Basic and Visual Basic, and C and C++ allow programmers to write programs in source code. The source code is then translated or compiled into object code, or machine language, which consists of the binary digits (the 0s and 1s) that make up the instructions that the processor recognizes and interprets. Java, Visual Basic, C, and C++ are modern programming languages.

Programs, if not compiled, may be interpreted, in which each line of the program code is converted into executable code immediately before it is executed. Programs that are interpreted normally execute much more slowly than the same programs that are compiled (assuming that there is an option to interpret or compile) because the compiler is normally able to optimize the compiled code for execution speed.

a. Fourth-Generation Languages

Fourth-generation languages are languages that enable end users to develop applications with little or no technical assistance. Fourth-generation languages tend to be less procedural than conventional programming languages, requiring less specification of the sequence of steps that the program is to follow.

b. Object-Oriented Programming

Traditional programming has treated the actual software instructions and the data that was being processed by the program as different things. *Object-oriented programming* combines the data and the specific procedures that operate on that data into one "thing" called an object. Object-oriented programming is intended to produce reusable code. Certain programming languages such as Java and C++ are object-oriented programming languages.

c. Debugging

Debugging is the process of finding errors in computer programs and correcting them.

Commercial products are available that aid in debugging programs.

3. Application Software

Application software includes the diverse group of systems and programs that an organization uses to accomplish its objectives. Application software can be generic (e.g., word processors, spreadsheets, databases, or accounting systems) or custom developed.

a. Licensing the Use of Software

Purchasing software normally means purchasing the license to use the software under certain prescribed terms and conditions, which, with some vendors, can be negotiated. Maintenance (updates and support) may or may not be acquired along with the use of the software.

b. Escrowing of the Source Code

If application software is acquired from an outside vendor, the organization acquiring the application may or may not obtain access to the source code. For large commercial applications, the source code may be escrowed with an escrow agent of some type. Escrow of the source code supposedly protects the purchaser if the outside vendor fails to live up to its contractual obligations.

c. Groupware

Terminology for some types of application software includes groupware (short for group working software), which is software that lets different people work on the same documents and coordinate their work activities. Groupware is especially useful for less structured work that requires high knowledge and/or skill.

D. Networks

1. Network

A *network* is a group of interconnected computers, terminals, communications channels, communications processors, and communications software. These components are discussed in the context of a LAN because LANs have been heavily tested in the past.

2. Local Area Network (LAN)

Local area networks (LANs) permit shared resources (software, hardware, and data) among computers within a limited area. LANs are normally privately owned, which means that they do not use telephone lines or that they use private lines leased from telecommunications providers. Components of a LAN (and other networks) include the following:

a. Node

A node is any device connected to a network.

b. Workstation

A workstation is a node (usually a PC) that is operated by end users.

c. Server

A *server* is a node dedicated to providing services or resources to the rest of the network (e.g., a file server maintains centralized application and data files, a print server provides access to high-quality printers, a database server provides access to a specific database, etc.). A server is generally not directly accessible by individual users but only through the network software.

d. Network Interface Card (N/C)

A *network interface card* is a circuit board installed on a node that allows the node to connect with and communicate over the network.

e. Transmission Media

The *transmission media* is the physical path between nodes on a network. It may be wired (e.g., twisted pair, which is normal telephone wires; coaxial cable, which is similar to cable TV cables; and fiber optic cable, which uses light to transmit signals) or wireless. LAN communications media are normally dedicated lines (i.e., used only by the network). Various transmission media have different transmission capabilities (speed and other characteristics).

f. Network Operating System (NOS)

A network operating system manages communication over a network. It may be either a peer-to-peer system (in which all nodes share in communications management) or a client/server system (in which a central machine serves as the mediator of communication on the network). Some common personal computer network operating systems are the server versions of Microsoft Windows® and Microsoft NT® and Novell NetWare®.

g. Communications Devices/Modems

A communications device provides remote access and provides a network with the ability to communicate with others. For example, modems translate digital data into the analog format needed to use telephone lines (telephone conversations are analog signals and computer communications are digital signals), and gateways allow connection of two dissimilar networks (e.g., a LAN to the Internet).

h. Communication/Network Protocols

In order to transmit information from one place to another, a telecommunications network must perform the following functions: establish an interface between the sender and the receiver (the two devices have to be talking to each other); transmit the information; route messages along the various paths the information might travel (long messages are divided into pieces and routed from the sender to the receiver with no assurance that the various pieces will follow exactly the same route); check for transmission errors; and convert messages from one speed or transmission format to another. Various pieces of hardware and software perform these functions, all of which communicate by adhering to a common set of rules called a communication or network protocol.

i. Gateways and Routers

A *gateway* is a combination of hardware and software that connect different types of networks by translating from one set of network protocols to another. A router is used to route packets of data through several interconnected LANs or to a WAN. A *bridge* is used to connect segments of a LAN which both use the same set of network protocols (LANs are often divided into segments for better performance or improved manageability).

j. Client/Server Configurations

Most LANs (and WANs) are set up as client/server systems. Workstations are referred to as clients. Other processors that provide services to the workstations are called servers. The workstations send requests for data and other services to the servers. Typically, several different servers perform different types of specialized services.

k. Network Topologies

The topology of a network defines the physical configuration of the devices and the cables that connect them. Topologies that have been employed for LANs (and WANs) are bus, ring, star, and tree.

(1) Bus Networks

Bus networks use a common backbone to connect all of the devices on the network (imagine a single straight-line backbone with a number of devices connected to it). Signals are transmitted over the backbone in the form of messages that are transmitted to and are received by all of the devices (in both directions from the transmitting device), but only the intended device actually accepts and processes the message; the other devices ignore the message. If any of the devices in a bus topology are down, the entire network is down. Only one device can transmit at a time; the other devices must wait until the backbone is free. If two devices transmit at the same time, the two messages will collide and both of them must be transmitted again. Ethernet is an example of a bus topology.

(2) Ring Networks

Ring networks are formed in a ring with each device connected to two other devices. Signals are transmitted in the form of messages that are transmitted to and are received by all of the devices sequentially, but only the intended device actually accepts and processes the message. If any of the devices in a ring topology are down, the entire network is down.

(3) Star Networks

Star networks are formed in a star with each device connected to a central "hub." The hub controls the transmission. If any of the devices in a star topology are down, only that device is down; if the hub is down, the entire network is down. Telephone systems connected to a PBX and many home networks are examples of star topologies.

(4) Tree Networks

Tree networks connect multiple stars into a bus. Each hub is connected to the bus and handles the transmission for its star.

(5) Backbone

The backbone is that part of a network that carries the major portion of the network traffic.

(6) Bandwidth

Bandwidth is a measure of a communication medium's information carrying capacity. A number of different definitions of bandwidth exist, depending on the context.

(7) Ethernet

Ethernet is a large collection of frame-based networking technologies for LANs. Ethernet incorporates a number of wiring and speed standards for the physical layer and a common addressing and message format.

(8) File Transport Protocol (FTP)

File transport protocol (FTP) is a network protocol used to exchange files.

(9) IPv4

IPv4 is the current version of IP with 32-bit addresses. IPv6 is a newer version of IP with 128-bit addresses. Without IPv6, the Internet will run out of network addresses in fewer than 10 years. IPv4, only allows approximately 4 billion network addresses (232). IPv6 allows 2128 addresses.

(10) Simple Mail Transfer Protocol (SMTP)

Simple mail transfer protocol (SMTP) is a protocol for transmitting text-based e-mail. SMTP provides outbound, not inbound, mail transport.

(11) Simple Network Management Protocol (SNMP)

Simple network management protocol (SNMP) is a protocol for monitoring a network. In SNMP, a piece of software called an agent runs on each of the devices being monitored (called a managed object) and reports information to the network management/monitoring system.

(12) Single Log-in

A single log-in (or single sign-on) is a system that allows a user who utilizes several different systems the ability to log in to them all with one user ID and one password. It attempts to combat the proliferation of different user IDs and passwords that may occur in an organization with multiple security systems, possibly for multiple hardware platforms (each password with different rules and possibly different expiration dates).

(13) Storage Area Network (SAN)

A *storage area network* is a network that contains remote storage devices (disk arrays, tape libraries, and CD arrays) to servers in such a way that the devices appear to the operating system to be local devices. These days, SANs are used mostly in large organizations.

(14) Voice over Internet Protocol (VoIP)

Voice over Internet Protocol is the routing of voice conversations over the Internet. A protocol called Multiprotocol Label Switching is used on network backbones to label different types of IP traffic for prioritization; voice traffic needs some priority for reasonable conversations.

3. Wide Area Networks (WANs)

Wide area networks (WANs) allow national and international communications. They usually employ nondedicated public communications channels (e.g., fiber optic, terrestrial microwave, or satellite) as their communications media. WAN communication services may be provided by value added networks, Internet-based networks, or point-to-point networks (direct private/proprietary network links normally using leased lines).

a. Value Added Networks

Value added networks (VANs) are privately owned and managed communications networks that provide additional services beyond standard data transmission. VANs are often used for electronic data interchange (called EDI, covered previously).

- (1) VANs provide many additional services, including automatic error detection, protocol conversion, and message storing and forwarding. With VANs, the various parties attempting to communicate do not have to use the same network protocols; the VAN provides the translation or conversion.
- (2) VANs provide good security because they are private networks.
- (3) VANs often batch transactions and send them at night when line traffic is lower. This periodic processing can delay data transfer for hours (or even days).
- (4) With VANs, messages are separated by vendor, batched together, and transmitted to their specific destinations.
- (5) VANs normally charge a fixed fee plus a fee per transaction and can be prohibitively expensive for smaller companies.

b. Internet-Based Networks

Internet-based networks use Internet protocols and public communications channels to establish network communications. The Internet itself is an international network composed of servers around the world that communicate with each other. There is no government involvement or control. Internet service providers (ISPs) provide access for individuals to the Internet.

Internet-based networks are used to establish communication among a company's LANs (e.g., an intranet) as well as to transmit EDI transactions. Advantages to submitting EDI transactions over the Internet rather than using a VAN include:

- (1) Individual transactions are transmitted immediately and usually reach their destination within minutes.
- (2) Internet transaction costs are substantially lower, making EDI more affordable for smaller companies.
- (3) The relative affordability of the Internet increases the number of potential trading partners.
- (4) Internet-based networks are sometimes called virtual private networks. The virtual, like the virtual in virtual memory, means that the networks are not really private; they just look like they are.

c. Intranets and Extranets

Intranets and extranets use Internet protocols and public communications media rather than proprietary systems (so that Internet browsers can be used) to create a company-wide network.

(1) Intranets

Intranets connect geographically separate LANs within a company. Companies can use low-cost Internet software, such as browsers, to build Internet sites, such as human resources and internal job postings. An intranet is more secure than the Internet because it has restricted user community and local control.

(2) Extranets

Extranets permit company suppliers, customers, and business partners (a general term for customers, suppliers, etc.) to have direct access to the company's network.

4. Wireless Networks

a. Security Risks

Many organizations also provide wireless access to their information systems. Wireless access is convenient and easy. This ease of access provides another venue for attack and extends the perimeter that must be protected. For example, a number of companies have experienced security incidents in which intruders used a laptop equipped with a wireless network interface controller (NIC) to access the corporate network while sitting in a car parked outside the building. Wireless signals can often be picked up from miles away.

b. Security Standards

Industry standards provide security approaches based on the character of wireless connections.

(1) Wi-Fi

Wi-Fi is a set of standards for wireless LANs. Equipment that uses this standard often can interfere with microwave ovens, cordless telephones, and other equipment using the same frequency. The transmission is just radio waves going through the air. Wi-Fi is a wireless form of Ethernet.

(2) Wi-Fi Protected Access

Wi-Fi protected access is an industry standard specifying security mechanisms for Wi-Fi. It supersedes the previous security specification called WEP (wired equivalent privacy). The use of WEP was optional, which meant that some organizations did not use it at all and were totally unprotected. The standard used a 40-bit encryption key and the same encryption key was shared by all users. The Wi-Fi protected access standard provides for an encryption key that is longer and is changed periodically.

(3) Bluetooth

Bluetooth is the popular name for the networking standard for small personal area networks. Bluetooth can be used to connect up to eight devices (PDAs, mobile phones, laptops, PCs, printers, digital cameras, and the like) within a 100-meter radius, depending on the power of the transmission area using low-power radio-based communication. The acronym for personal area networks is PAN. Many wireless keyboards and mice utilize Bluetooth.

(4) Wireless Networking Devices

Wireless networking devices can operate in two modes: infrastructure mode and ad hoc mode. Infrastructure mode anticipates networking devices communicating through an access point. Ad hoc mode anticipates that networking devices are physically close enough that they can communicate without the access point.

(5) Wireless Application Protocol (WAP)

Wireless application protocol (WAP) is a protocol that enables cellphones and other wireless devices to access Web-based information and services.

(6) 4G

4G is the designation for fourth-generation cellular networks. The first-generation (1G) networks in the early 1980s were analog and could be used only for voice communications. The second-generation (2G) networks in the early 1990s were digital and provided better voice quality and global roaming and could be used for voice and data communications. Third-generation (3G) networks utilize packet switching technology for higher speeds and can be used for broadband digital services. Fourth-generation (4G) has increased speed over 3G.

(7) Access Log

An access log is a file with information about each access to a file or website. (See also system access log and electronic access controls.) Access logs provide some security but only if the logs are periodically reviewed and unusual activity is investigated.

(8) Access Point

An access point is a device that connects wireless communication devices together to form a wireless network. An access point is often called a wireless access point (WAP, but the acronym should not be confused with the other WAP, wireless application protocol). The access point normally connects to a wired network but could also be as simple as a smart phone serving as an access point (called a hot spot). With the capacity and speed of 4G service, users can use the smartphone to connect several (sometimes as many as eight) wireless devices to a single phone hot spot. Several WAPs can link to form a larger network that allows roaming. Wireless access points have IP addresses for configuration and management of the network.

BUSINESS 5

Economic Concepts

1.	Changes in economic and business cycles	3
2.	Economic measures and indicators	. 14
3.	Market influence on business strategies	. 28
4	Class questions	63

NOTES

CHANGES IN ECONOMIC AND BUSINESS CYCLES

Economics is defined as a science that studies human behavior as the relationship between ends and scarce means that have alternative uses. In essence, economics is about people (e.g., individuals, corporations, governments) and the choices they make. Because economics is a crucial component of the business environment which ultimately affects an individual's, company's, or government's performance (and financial reporting), it is considered an important area of study in the Business Environment and Concepts (BEC) curriculum.

I. BUSINESS CYCLES

A. Introduction

Business cycles refer to the rise and fall of economic activity relative to its long-term growth trend (i.e., the swings in total national output, income, and employment over time). Although the economy tends to grow over time, the growth in economic activity is not stable. Rather, economic activity is characterized by fluctuations, and these fluctuations are known as business cycles. Business cycles vary in duration and severity. The analysis of business cycles is part of the field of macroeconomics. Macroeconomics is the study of the economy as a whole. It examines the determinants of national income, unemployment, inflation, and how monetary and fiscal policies affect economic activity.

B. Measuring Economic Activity—Gross Domestic Product

Because business cycles refer to the rise and fall of economic activity, it is important to first examine how economic activity is measured. The most common measure of the economic activity or output of an economy is Gross Domestic Product (GDP). GDP is the total market value of all final goods and services produced within the borders of a nation in a particular period. The term "final goods and services" excludes used goods that have been resold; GDP is the nation's output of goods and services. Note that GDP includes all final goods and services produced by resources within a country regardless of who owns the resources. Thus, U.S. GDP includes the output of foreign-owned factories in the U.S. but excludes the output of U.S.-owned factories operating abroad.

C. Nominal vs. Real GDP

1. Nominal GDP Not adjusted for inflation

Nominal GDP (unadjusted) measures the value of all final goods and services in prices prevailing at the time of production. That is, nominal GDP measures the value of all final goods and services in current prices.

→ Included in GNP

2. Real GDP

a. Definition

Real GDP (adjusted) measures the value of all final goods and services in constant prices. That is, real GDP is adjusted to account for changes in the price level (i.e., it removes the effects of inflation by using a price index). Real GDP is the most commonly used measure of economic activity and national output (i.e., the total output of an economy).

b. Price Index (GDP deflator)

The price index used to calculate real GDP is called the GDP deflator. It is a price index for all goods and services included in GDP. Using the GDP deflator, real GDP is calculated as the ratio of nominal GDP to the GDP deflator times 100.

Real GDP =
$$\frac{\text{Nominal GDP}}{\text{GDP deflator}} \times 100$$

-Inflation

EXAMPLE—APPLICATION OF PRICE INDEX TO DETERMINE REAL GDP

Assume that a local economist is attempting to measure an economy's real GDP and the change in real GDP from the prior year. Based on his research, the following economic data is gathered on the economy's production:

	<u>Current Year</u>	<u>Prior Year</u>
Nominal GDP (\$ billions)	\$3,450.3	\$3,286.0
GDP deflator	107.0	105.0

Question 1: Using the table above, what is the real GDP for the current and prior year?

Question 2: What is the change in real GDP for the economy?

Solution 1

The following formula is used to measure real GDP:

Real GDP =
$$\frac{\text{Nominal GDP}}{\text{GDP deflator}} \times 100$$

Current year = $\frac{\$3,450.3}{107.0} \times 100$
= $\$3,224.6$ billion
Prior year = $\frac{\$3,286.0}{105.0} \times 100$
= $\$3,129.5$ billion

Solution 2

The following formula is used to measure the change in real GDP:

%
$$\triangle$$
 Real GDP =
$$\frac{\text{Current year real GDP}}{\text{Past year real GDP}} - 1$$
$$= \frac{\$3,224.6}{\$3,129.5} - 1$$
$$= +3.04\%$$

D. Real GDP per Capita and Economic Growth

Real GDP per capita is real GDP divided by population. Real GDP per capita is typically used to compare standards of living across countries or across time. Real GDP per capita is also used to measure economic growth. Economic growth is the increase in real GDP per capita over time.

E. Summary Composition of Business Cycles

As noted previously, economic activity is characterized by fluctuations, and these fluctuations are known as business cycles. Business cycles typically comprise:

1. Expansionary Phase GDP↑ profits↑ unemployment↓ prices↑

An expansionary phase is characterized by rising economic activity (real GDP) and growth. During an expansionary phase, economic activity is rising above its long-term growth trend. Firms' profits are likely to be rising during an expansionary phase as the demand for goods and services increases. Firms also are likely to increase their workforces during an expansion, and the prices of goods and services are likely to be rising.

2. Peak

A peak is a high point of economic activity. It marks the end of an expansionary phase and the beginning of a contractionary phase in economic activity. At the peak of a business cycle, firms' profits are likely to be at their highest levels. Firms also are likely to face capacity constraints and input shortages (raw material and labor), leading to higher costs and higher overall price levels.

3. Contractionary Phase GDP & profits & unemployment

A contractionary phase is characterized by falling economic activity and growth and follows a peak. During a contractionary phase, firms' profits are likely to be falling from their highest levels.

4. Trough

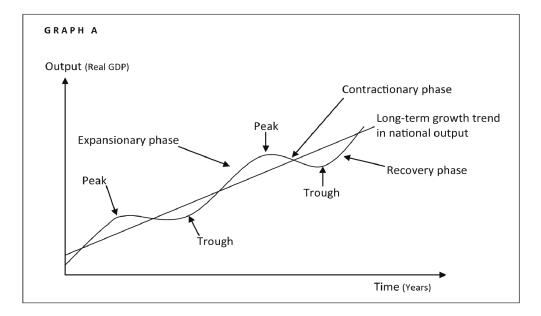
A trough is a **low point** of economic activity. At this point of the business cycle, firms' profits are likely to be at their lowest levels. Firms also are likely to experience significant excess production capacity, leading them to reduce their workforces and cut costs.

5. Recovery Phase

A recovery phase follows a trough. During a recovery phase, economic activity begins to increase and return to its long-term growth trend. Further, firms' profits typically begin to stabilize as the demand for goods and services begins to rise.

F. Illustration

Graph A illustrates the business cycle.



II. TERMINOLOGY USED IN DESCRIBING BUSINESS CYCLES

A. Recession Contractionary phase: GDP profits unemployment

A recession occurs when the economy experiences negative real economic growth (declines in national output). Economists define a recession as two consecutive quarters of falling national output. During a recession, firms' profits tend to fall and many firms incur losses. Firms also are likely to have excess capacity. As a result, during a recession, resources (including labor) are likely to be underutilized and unemployment is likely to be high.

B. **Depression**

A depression is a very severe recession. It is characterized by a relatively long period of stagnation in business activity and high unemployment rates. As a result, firms will experience significant excess capacity. Furthermore, due to the significant reduction in the demand for goods and services, it is likely that many firms will go out of business during a depression.

III. ECONOMIC INDICATORS

Although business cycles tend to be irregular and unpredictable, economists nevertheless attempt to predict business cycles and their severity and duration using economic indicators. Economic indicators (gathered by The Conference Board) are statistics that historically have been highly correlated with economic activity. They can be "leading indicators," "lagging indicators," or "coincident indicators."

A. (Leading)Indicators

Leading indicators tend to predict economic activity. They change before the economy starts to follow a certain trend. The government routinely revises the numbers as more data becomes available. Thus, leading indicators are subject to change.

Leading indicators include:

- 1. Average new unemployment claims
- 2. Building permits for residences
- 3. Average length of the workweek
- 4. Money supply (M2)
- 5. Standard and Poor's 500 stock index
- 6. Orders for goods
- 7. Price changes of materials
- 8. Index of consumer expectations
- 9. Interest rate spread
- 10. Index of supply deliveries

B. Lagging Indicators

Lagging indicators tend to follow economic activity, i.e., they change after a given economic trend has already started. They give signals after the fact. Economists measure lagging indicators to confirm or dispute previous forecasts and the effectiveness of policy directives.

Lagging indicators include:

- 1. Prime rate charged by banks
- 2. Average duration of unemployment

- 3. Commercial and industrial loans outstanding
- 4. Consumer price index for services
- 5. Consumer debt-to-income ratio
- 6. Changes in labor cost per unit of manufacturing output
- 7 Inventories-to-sales ratio

C. Coincident Indicators

Coincident indicators change at approximately the same time as the whole economy, thereby providing information about the current state of the economy. A coincident indicator may be used to identify, after the fact, the timing of peaks and troughs in a business cycle.

Coincident indicators include:

- 1. Industrial production
- 2. Manufacturing and trade sales
- 3. Industrial production (GDP)
- 4. Personal income less transfer payments

REASONS FOR FLUCTUATIONS IV

Although there are a variety of theories regarding the cause of business cycles, economists generally agree that business cycles result from shifts in aggregate demand and/or aggregate supply. Aggregate demand and aggregate supply curves can be used to illustrate the relationship between a country's output (real GDP) and price level (the GDP deflator). They also are used to examine the causes of economic fluctuations. Y-axis

Aggregate Demand (AD) Curve A.

Downward sloping The aggregate demand (AD) curve illustrates the maximum quantity of all goods and services that households, firms, and the government are willing and able to purchase at any given price level. It shows the relationship between total output (real GDP) of the economy and the price level. Note that this "aggregate" demand curve is the macroeconomic demand curve of the "total" demand in the economy as a whole. The x-axis is real GDP and the y-axis is the

B. Aggregate Supply (AS) Curve

price level.

The aggregate supply (AS) curve illustrates the maximum quantity of all goods and services producers are willing and able to produce at any given price level. Note that this "aggregate" supply curve is the macroeconomic supply curve of the "total" supply in the economy as a whole.

1. Short-Run Aggregate Supply Curve



The short-run aggregate supply (SRAS) curve is upward sloping, illustrating that as the price level rises, firms are willing to produce more goods and services.

Long-Run Aggregate Supply Curve

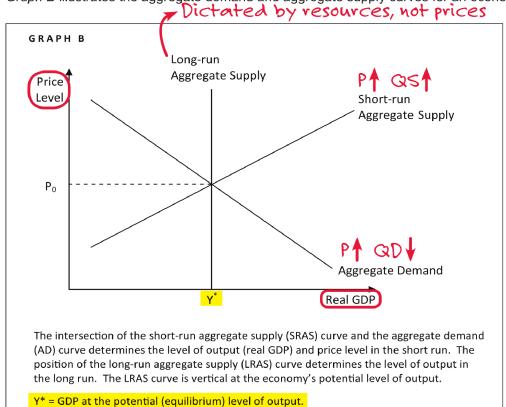
The long-run aggregate supply (LRAS) curve is vertical, illustrating that in the long run, if all resources are fully utilized, output is determined solely by the factors of production. This curve corresponds to the potential level of output in the economy.

3. Potential Level of Output (potential GDP)

Potential GDP refers to the level of real GDP (national output) that the economy would produce if its resources (capital and labor) were fully employed. When real GDP is below the potential level of output, the economy will typically be experiencing a recession. Similarly, when real GDP rises above the potential level of output, the economy typically will be experiencing an expansion.

C. Illustration

Graph B illustrates the aggregate demand and aggregate supply curves for an economy.



D. Aggregate Demand, Aggregate Supply, and Economic Fluctuations

Business cycles, or economic fluctuations, are the result of shifts in aggregate demand and short-run aggregate supply (note that shifts in the long-run aggregate supply curve are associated with long-run growth in the economy and do not affect business cycles).

1. Reduction in Demand GDP profits \ unemployment ↑ prices \

If circumstances cause individuals, businesses, or governments to reduce their demand for goods and services, economic activity (real GDP) will decline, leading to a contraction in economic activity and possibly a recession. As a result, a reduction in demand tends to cause firms' profits to decline. Firms also are likely to experience an increase in excess capacity, leading them to reduce their workforces.

2. Increase in Demand GDP↑ profits↑ unemployment prices↑

In contrast, if circumstances cause individuals, businesses, and governments to increase their demand for goods and services, economic activity will rise, leading to a recovery or an expansion in economic activity. As a result, an increase in demand tends to cause firms' profits to rise. Firms also are likely to experience a reduction in excess capacity, leading them to increase their workforces.

3. Reduction of Supply GDP profits \ unemployment↑ prices↑

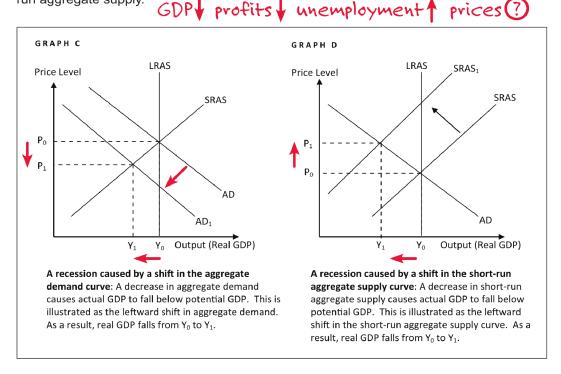
If circumstances cause firms to reduce their supply of goods and services, economic activity will fall, leading to a contraction or possibly a recession. As firms reduce their supply, they also are likely to reduce their workforces, leading to higher unemployment.

4. Increase in Supply GDP↑ profits↑ unemployment prices

If circumstances cause firms to increase their supply of goods and services, economic activity will rise, leading to an expansionary phase of economic activity. As firms increase their supply, they also are likely to increase their workforces, leading to lower unemployment.

2 types

Graphs C and D illustrate recessions caused by shifts in aggregate demand and short-run aggregate supply.



E. Factors That Shift Aggregate Demand

The primary factors that shift aggregate demand are:

- 1. Changes in Wealth
 - a. Increase in Wealth AD GDP unemployment prices

An increase in wealth causes the aggregate demand curve to shift to the right.

Thus, an increase in wealth causes the economy to expand and leads to an increase in national output (real GDP).

Decrease in Wealth AD & GDP & unemployment & prices

A decrease in wealth causes the aggregate demand curve to shift to the left. A decrease in wealth does the opposite of an increase in wealth. For example, a large decline in stock prices would decrease consumer wealth and therefore shift the aggregate demand curve to the left. As a result, national output would fall, causing a contraction and possibly a recession.

Changes in Real Interest Rates 2.

Increase in Real Interest Rates AD GDP unemployment prices ↓

Save more & borrow less

An increase in interest rates increases the cost of capital and, therefore, tends to reduce consumer demand for durable goods, such as new cars and homes, and firms' demand for new plants and equipment. Therefore, an increase in real interest rates causes the cost of capital to rise and shifts the aggregate demand curve to the left, causing national output to fall. Decrease in Real Interest Rates AD & GDP & unemployment & prices &

Saveless & borrow more

A decrease in real interest rates reduces the cost of borrowing, thereby increasing the demand for investment goods and shifting the aggregate demand curve to the right, causing national output to rise.

- Changes in Expectations About the Future Economic Outlook (consumer confidence)
 - Confident Economic Outlook AD↑ GDP↑ unemployment & prices↑ If households become confident about the economic outlook (consumer confidence

increases), their willingness to acquire investment and consumer goods increases and the aggregate demand curve shifts right, causing national output to rise.

- When the economic outlook appears more uncertain, consumers tend to reduce current spending, shifting aggregate demand to the left and causing national output to fall.
- Changes in Exchange Rates (the price of a currency, as determined by supply and demand in 4 the currency markets)

If the currency of a country appreciates in real terms relative to the currencies of \$ more expensive its trading partners, its goods will become relatively more expensive for foreigners, while foreign goods will become relatively less expensive for its residents. As a result, net exports (exports minus imports) will fall, shifting the aggregate demand

curve to the left and causing national output to fall.

relative to foreign currencies

\$ less expensive relative to foreign currencies

Depreciated Currencies AD↑ GDP↑ unemployment & prices↑

"Weak"

If the currency of a country depreciates in real terms relative to the currencies of its trading partners, its goods will become relatively less expensive for foreigners, while foreign goods will become relatively more expensive for its residents. As a result, net exports (exports minus imports) will rise, shifting the aggregate demand curve to the right and causing national output to rise.

5. Changes in Government Spending

- a. Increase in Government Spending AD↑ GDP↑ unemployment ↓ prices↑
- An *increase* in government spending shifts the aggregate demand curve to the right, causing national output to rise.
- A decrease in government spending shifts the aggregate demand curve to the left, causing national output to fall.

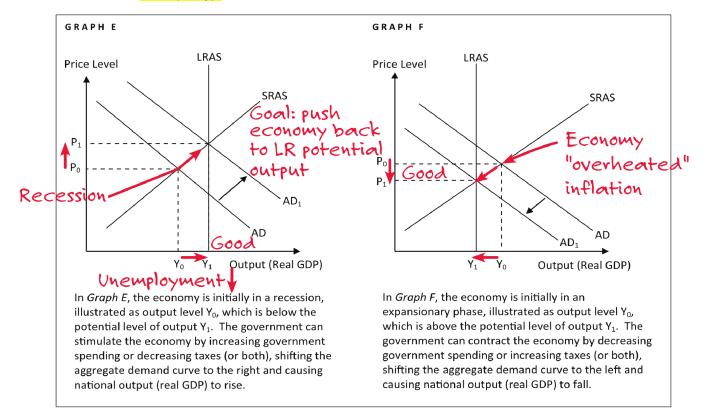
6. Changes in Consumer Taxes

- a. Increase in Consumer Taxes AD & GDP & unemployment & prices
- An *increase* in consumer taxes (e.g., the personal income tax) reduces the disposable income (gross income minus taxes) of consumers and, therefore, shifts the aggregate demand curve to the left, causing national output to fall.
 - b. Decrease in Consumer Taxes AD GDP unemployment prices

A *decrease* in consumer taxes increases the disposable income of consumers and therefore shifts the aggregate demand curve to the right, causing national output to rise.

7. Illustration—Changes in Government Spending and/or Taxes

Graph E illustrates the effect of an increase in government spending and/or a decrease in taxes (known as expansionary fiscal policy), and Graph F illustrates the effect of a decrease in government spending and/or an increase in taxes (known as contractionary fiscal policy).



PASS KEY

Remember the factors that shift aggregate demand as **TWICE G**overnment:

Taxes

Wealth

Interest Rates

Consumer Confidence

Exchange rates

Government Spending

F. Multiplier Effect

The *multiplier effect* refers to the fact that an increase in consumer, firm, or government spending produces a multiplied increase in the level of economic activity. For example, a \$1 increase in government spending results in a greater than \$1 increase in real GDP. The multiplier effect stems from the fact that increases in spending generate income for firms, which in turn spend that income. Their spending gives other households and firms income, and so on. Therefore, the effect of a \$1 increase in spending is magnified by the multiplier effect. The multiplier effect results from the marginal propensity to consume (MPC). The MPC is the change in consumption due to a \$1 increase in income. Because people tend to save part of their income, the MPC is typically less than one. Using the MPC, the size of the multiplier effect can be calculated using the following formulas:

Multiplier =
$$\frac{1}{(1 - MPC)}$$
 = $\frac{1}{MPS}$
Change in real GDP = Multiplier = Change in spending

Note: The examiners could refer to "1 – MPC" as the marginal propensity to save (MPS), so be aware of this terminology as well.

EXAMPLE

Suppose the MPC is 0.8 (i.e., the change in consumption due to a \$1 increase in income is 80 cents) and that spending increases by \$100.

Then the multiplier effect would be:

Change in real GDP =
$$\frac{1}{(1-0.8)} \times $100 = $500$$

Thus, a \$100 increase in spending results in a \$500 increase in real GDP.

G. Factors That Shift Short-Run Aggregate Supply

Recall that shifts in long-run aggregate supply are associated with economic growth, not business cycles. Therefore, when discussing business cycles, we focus on shifts in the short-run aggregate supply curve.

The primary factors that shift short-run aggregate supply are:

1. Changes in Input (Resource) Prices

An *increase* in input prices (raw material prices, wages, etc.) causes the short-run aggregate supply curve to shift left. Thus, an increase in input prices causes the economy to contract and leads to a decrease in national output (real GDP).

EXAMPLE

A large increase in oil prices (oil is a primary input in production) would shift the short-run aggregate supply curve to the left. As a result, national output would fall, causing a contraction and possibly a recession. This was illustrated in *Graph D* earlier.

b. Decrease in Input Prices AS↑ GDP↑ unemployment prices

A decrease in input prices causes the short-run aggregate supply curve to shift to the right. A decrease in input prices causes the economy to expand and leads to an increase in national output (real GDP).

2. Supply Shocks

- a. Supplies Are Plentiful AST GDPT unemployment prices
- If resource supplies become more plentiful, the short-run aggregate supply curve will shift to the right, causing national output to increase.
 - b. Supplies Are Curtailed AS & GDP & unemployment of prices
- If resource supplies are curtailed (e.g., crop failures, damage to infrastructure caused by earthquakes, etc.) the short-run supply curve will shift to the left, causing national output (real GDP) to decline.

ECONOMIC MEASURES AND INDICATORS

OVERVIEW I.

Economists and policy makers rely on a host of economic measures or indicators to determine the overall state of economic activity. Some of the most commonly cited economic measures are: (1) real gross domestic product (real GDP), (2) the unemployment rate, (3) the inflation rate, and (4) interest rates. It is important to remember that these economic measures tend to move together. For example, when real GDP is rising, unemployment tends to be falling. Similarly, when the unemployment rate is rising, the inflation rate tends to be falling.

II. THE NATIONAL INCOME ACCOUNTING SYSTEM

The National Income and Product Accounting (NIPA) system was developed by the U.S. Department of Commerce to monitor the health and performance of the U.S. economy. The two methods for measuring GDP, expenditure approach and income approach are calculated using NIPA. The combined economic output of the following four sectors is called gross domestic product (GDP), the total dollar value of all new final goods and services produced within the economy in a given period. -Or spending

- Households (or consumers)
- **Businesses**
- Federal, state, and local governments
- The foreign sector

A. Two Methods of Measuring GDP

The two methods of measuring GDP are the expenditure approach and the income approach.

Expenditure Approach

Under the expenditure approach, GDP is the sum of the following four components:

- Government purchases of goods and services
- Gross private domestic Investment (nonresidential fixed investment, residential fixed investment, and change in business inventories) Business
- Personal Consumption expenditures (durable goods, nondurable goods, and services)
- Households Net **Exports** (exports minus imports)

The underlined letters form the mnemonic GICE.

+ Net exports - Net imports

2. The Income Approach

The income approach accounts for GDP as the value of resource costs and incomes generated during the measurement period. The income approach includes business profits, rent, wages, interest, depreciation, and business taxes. Under the income approach, GDP is the sum of the following eight components:

Total business income

Income of proprietors

Profits of corporations

Interest (net)

Rental income

Adjustments for net foreign income and miscellaneous items

Taxes (indirect business taxes)

Employee compensation (wages)

Depreciation (also known as capital consumption allowance)

The underlined letters form the mnemonic **I PIRATED**.

B. Comparison of Approaches

The two different approaches are used to prepare an "income statement" for the domestic economy (the GDP), as shown in the following table.

- 1. The aggregate expenditures approach on the left is a flow of product approach (at market prices).
- 2. The income approach on the right is a flow of earnings and other resources that generate domestic income.

COMPARISON OF APPROACHES							
(billions of dollars)							
Expenditures Approach (flow-of-product) Income Approach (earnings and costs)							
Government purchases	\$1,314.7	Income of proprietors	\$ 450.9				
Investment	1,014.4	Profits of corporations	526.5				
Consumption	4,698.7	Interest (net)	392.8				
Exports (net)	(96.4)	Rental income	116.6				
Net imports		Adjustments for net foreign income/miscellaneous	45.0				
•		Taxes (indirect business)	572.5				
		Employee compensation	4,008.3				
		D epreciation (consumption of fixed capital)	818.8				
Aggregate Expenditure	\$6,931.4	Domestic Income	<u>\$6,931.4</u>				

C. Other Measures of National Income

Although GDP is the most common measure of national income and an economy's output and performance, there are several other noteworthy measures.

1. Net Domestic Product (NDP)

Net domestic product is GDP minus depreciation (the capital consumption allowance).

2. Gross National Product (GNP) Fren if living overseas

Gross national product is defined as the market value of final goods and services produced by residents of a country in a given time period. GNP differs from GDP because GNP includes goods and services that are produced overseas by U.S. firms and excludes goods and services that are produced domestically by foreign firms. For example, if BMW produces cars in the United States, that production is counted as part of U.S. GDP, but it is not counted as part of U.S. GNP because BMW is a foreign-owned company.

3. Net National Product (NNP)

Net national product is defined as **GNP minus economic depreciation** (i.e., losses in the value of capital goods due to age and wear).

4. National Income (NI)

National income is NNP less indirect business taxes (e.g., sales tax).

5. Personal Income (PI)

Personal income is the income received by households and noncorporate businesses.

6. Disposable Income (DI)

Disposable income is personal income less personal taxes. It is the amount of income households have available either to spend or to save.

III. THE UNEMPLOYMENT RATE GDPV unemployment↑

The unemployment rate measures the ratio of the number of people classified as unemployed to the total labor force. The total labor force includes all non-institutionalized individuals 16 years of age or older who either are working or are actively looking for work. (An unemployed person is defined as a person 16 years of age or older who is available for work and who has actively sought employment during the previous four weeks.) Note that to be counted as unemployed, a person must be actively looking for work. The unemployment rate can be expressed as:

Unemployment rate =
$$\frac{\text{Number of unemployed}}{\text{Total labor force}} \times 100$$

A. Types of Unemployment

1. Frictional Unemployment

Frictional unemployment is normal unemployment resulting from workers routinely changing jobs or from workers being temporarily laid off. It is the unemployment that arises because of the time needed to match qualified job seekers with available jobs.

"Normal"

related

business

cycles

not

1. Frictional unemployment

2. Structural Unemployment

Structural unemployment occurs when:

- a. jobs available in the market do not correspond to the skills of the workforce; and
- b. unemployed workers do not live where the jobs are located.

3. Seasonal Unemployment

Seasonal unemployment is the result of seasonal changes in the demand and supply of labor. For example, shortly before Christmas, the demand for labor in some industries increases and then decreases again after Christmas.

4. Cyclical Unemployment Caused by decrease in AD or SRAS

Cyclical unemployment is the amount of unemployment resulting from declines in real GDP during periods of contraction or recession or in any period when the economy fails to operate at its potential. When real GDP is below the potential level of output, cyclical unemployment is positive. When real GDP is above the potential level of output, cyclical unemployment is negative. Thus, cyclical unemployment rises during a recession and falls during an expansion.

B. Natural Rate of Unemployment and the Meaning of Full Employment

1. Natural Rate of Unemployment

The *natural rate of unemployment* is the "normal" rate of unemployment around which the unemployment rate fluctuates due to cyclical unemployment. Thus, the natural rate of unemployment is the sum of frictional, structural, and seasonal unemployment or the employment rate that exists when the economy is at its potential output level.

2. Full Employment

Full employment is defined as the level of unemployment when there is no cyclical unemployment. Full employment does not mean zero unemployment. When the economy is operating at full employment, there is still frictional, structural, and seasonal unemployment.

IV. PRICE LEVEL AND INFLATION

A. Definitions

1. Inflation Increase in AD or decrease in AS

Inflation is defined as a sustained increase in the general prices of goods and services. It occurs when prices on average are increasing over time.

2. Deflation Decrease in AD or increase in AS

Deflation is defined as a sustained decrease in the general prices of goods and services. It occurs when prices on average are falling over time.

Most economists believe that deflation is a much bigger economic problem than inflation. During periods of deflation, firms are likely to experience significant excess production capacity. This occurs because consumers tend to hold off purchasing goods and services during a period of deflation because they realize that the price of goods and services is likely to continue to fall. Consequently, firm profits are likely to be falling during periods of deflation.

3. Inflation/Deflation Rate

The *inflation* or *deflation rate* is typically measured as the percentage change in the consumer price index (CPI) from one period to the next.

a. Consumer Price Index (CPI)

The consumer price index (CPI) is a measure of the overall cost of a fixed basket of goods and services purchased by an average household. The CPI is computed as follows:

$$CPI = \frac{Current cost of market basket}{Base year cost of market basket} \times 100$$

EXAMPLE

A doctoral student in economics is working on her dissertation. As part of her research, she selects four goods (products) that are consumed by college students on the local campus and then collects data to determine the average price changes for these products over the past 10 years. After the data is gathered, she calculates a (consumer) price index for these four products as follows:

	Time = 0	Time = Year 10
	(Base year)	(Current year)
Product A	\$ 3.00	\$ 4.80
Product B	\$25.00	\$39.00
Product C	\$17.00	\$22.00
Product D	\$ 6.00	\$ 8.20
Total	\$51.00	\$74.00

Note: The prices for each product above are the average prices for T=0 and T=10.

$$CPI = \frac{\$74.00 \times 100}{\$51.00}$$
$$= 145.1$$

b. Inflation Rate

Using the CPI, the inflation rate is calculated as the percentage change in the CPI from one period to the next:

Inflation rate =
$$\frac{\text{CPI}_{\text{this period}} - \text{CPI}_{\text{last period}}}{\text{CPI}_{\text{last period}}} \times 100$$

$$\frac{145.1 - 138.3}{138.3} \times 100$$

$$= 4.92\%$$

c. Producer Price Index (PPI)

The *producer price index* (PPI) measures the overall cost of a basket of goods and services typically purchased by firms.

В. **Causes of Inflation and Deflation**

Inflation and deflation are caused by shifts in the aggregate demand and short-run aggregate supply curves.

A rightward shift in the aggregate demand curve will cause the price level to rise, leading to inflation. Similarly, a leftward shift in the short-run aggregate supply curve will also cause the price level to rise, leading to inflation.

Demand-Pull Inflation AD



Demand-pull inflation is caused by increases in aggregate demand. Thus, demand-pull inflation could be caused by factors such as:

- a. increases in government spending;
- b. decreases in taxes:
- increases in wealth: or C.
- d. increases in the money supply.

2. **Cost-Push Inflation**

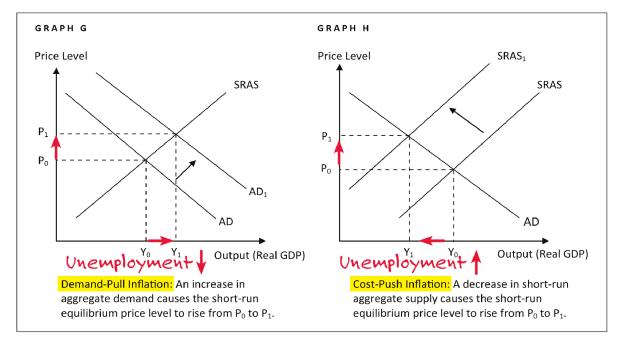


Cost-push inflation is caused by reductions in short-run aggregate supply. Thus, costpush inflation could be caused by factors such as:

- a. an increase in oil prices; or
- an increase in nominal wages. b.

3. Illustrations

Graphs G and H illustrate demand-pull and cost-push inflation using the aggregate demand and short-run aggregate supply curves.



4. Deflation AD ↓ SRAS ↑

Deflation is also caused by shifts in aggregate demand or short-run aggregate supply. A shift left in aggregate demand (perhaps brought about by a stock market crash or a large increase in taxes) will cause the aggregate price level to fall. Similarly, a shift right in the short-run aggregate supply curve will also cause the aggregate price level to fall.

C. Inflation and the Value of Money

Inflation has an inverse relationship with purchasing power. As the price level rises, the value of money (purchasing power) declines.

1. Definitions

a. Monetary Assets and Liabilities

Monetary assets and liabilities (e.g., cash, accounts receivable, notes payable, etc.) are fixed in dollar amounts regardless of changes in specific prices or the general price level.

b. Nonmonetary Assets and Liabilities

The value of nonmonetary assets (e.g., a building, land, machinery, etc.) and nonmonetary liabilities (e.g., rent collected in advance) will fluctuate with inflation and deflation.

2. Holding Monetary Assets = Lost purchasing power (bad)

During a period of inflation, those with a fixed amount of money or income (e.g., retired persons) will be hurt (i.e., their purchasing power will be eroded). Similarly, firms that loan money at fixed interest rates are likely to be hurt by inflation.

3. Holding Monetary Liabilities = Pay back debt with \$ worth less (good)

During a period of inflation, those with a fixed amount of debt (e.g., those with home mortgages) will be aided (i.e., the debt will be repaid with inflated dollars). Thus, inflation also tends to benefit firms with large amounts of outstanding debt.

EXAMPLE - OPEC AND THE STAGFLATION OF THE 1970s

From 1973 to 1974, OPEC (Organization of the Petroleum Exporting Countries) substantially curtailed its production of crude oil. As a result, the price of a barrel of crude oil rose from approximately \$2 a barrel in late 1973 to \$10 a barrel in late 1974.

This increase in the price of crude oil had a substantial effect on the U.S. economy. Specifically, rising crude oil prices represented an increase in input costs for U.S. firms. As a result, firms cut back production and the short-run aggregate supply curve shifted left.

This is the situation depicted in *Graph D* previously. As the short-run aggregate supply curve shifted left, national output (real GDP) began to decline, unemployment began to rise, and the aggregate price level began to rise (cost-push inflation).

The combination of falling national output and a rising price level is known as stagflation. The actions of OPEC in 1973–74 led to a recession in the U.S. that was particularly harsh because not only was the unemployment rate rising, but the newly unemployed were facing higher prices for goods and services due to inflation.

,Decrease in wealth - AD↓

EXAMPLE—THE GREAT DEPRESSION AND DEFLATION

The Great Depression began with the stock market crash of Oct. 29, 1929. By 1932, the Dow Jones Industrial Average had fallen 89% from its peak in 1929. In addition, shortly before the stock market crash, the Federal Reserve (the central bank of the U.S.) increased interest rates in an attempt to control inflation. It then increased interest rates again in early 1931.

Borrow Jess, save more AD

Although the stock market crash was not the only cause of the Great Depression, it did mark the beginning of the Great Depression. The Great Depression was caused by a number of factors, including ill-timed interest rate hikes by the Federal Reserve and protectionist trade policies, as well as the stock market crash. The table below shows what happened to real GDP, the unemployment rate, and the price level (as measured by the CPI) from 1929 through 1933.

			•
Year	Real GDP (Billions of 1987 Dollars)	Unemployment Rate	Price Level (CPI)
1929	821.8	3.15%	17.1
1930	748.9	8.71%	16.7
1931	691.3	15.91%	15.2
1932	599.7	23.65%	13.7
1933	587.1	24.87%	13.0

As the table illustrates, the Great Depression was characterized by falling output (falling real GDP), rising unemployment, and deflation. The deflation that occurred can be seen by noting that from 1929 through 1933, the price level fell continuously. Furthermore, at the height of the Great Depression, one out of every four workers was unemployed.

The data suggest that the Great Depression was caused by a shift left in aggregate demand, as in *Graph C*. Specifically, the stock market crash reduced household wealth, which shifted the aggregate demand curve to the left. In addition, the interest rate hikes orchestrated by the Federal Reserve increased the cost of capital, thereby decreasing the demand for investment goods and shifting the aggregate demand curve even further to the left. As aggregate demand fell, the price level also fell and the nation experienced a period of deflation.

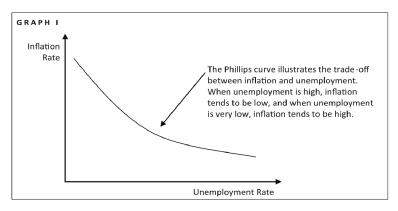
V. INVERSE RELATIONSHIP BETWEEN INFLATION AND UNEMPLOYMENT

A. The Phillips Curve When AD \ cause inflation: prices \ unemployment \

Inflation and unemployment are traditionally thought to have an inverse relationship in the short run. The *Phillips curve* illustrates the inverse relationship between the rate of inflation and the unemployment rate. It illustrates the trade-off that exists in the short run between inflation and unemployment. While unemployment and inflation have historically moved in opposite directions, during the oil shocks of the 1970s, the Phillips curve broke down. Specifically, the oil shocks (negative supply shocks) of the 1970s led to a situation in which both unemployment and the price level were rising.

B. Illustration of the Phillips Curve

The Phillips curve is illustrated in Graph I.



VI. BUDGET DEFICITS AND SURPLUSES

The budget is the federal government's plan for spending funds and raising revenues through taxation, fees, and other means (and for borrowing funds if necessary). The budget deficit and the budget surplus are important indicators of the current and future health of an economy.

A. Budget Deficits

A budget deficit occurs when a country spends more than it takes in (mostly in the form of taxes during the year).

1. Financing Budget Deficits

Budget deficits are usually financed by government borrowing, which affects interest rates. The government could also finance budget deficits by printing new money. Financing budget deficits by printing money, however, causes inflation.

2. Cyclical Budget Deficit

A cyclical budget deficit is caused by temporarily low economic activity. For example, a cyclical budget deficit might be caused by a recession and the resulting lower level of national output.

3. Structural Budget Deficit

A structural budget deficit is one that is caused by a structural imbalance between government spending and revenue. Structural deficits are not caused by temporarily low economic activity.

B. Budget Surpluses

A budget surplus occurs when government revenues exceed government spending during the year.

VII. INTEREST RATES

A. Nominal and Real Interest Rates

1. Nominal Interest Rate Not adjusted for inflation

The *nominal interest rate* is the amount of interest paid (or earned) measured in current dollars. When the economy experiences inflation, nominal interest rates are not a good measure of how much borrowers really pay or lenders really receive when they take out or make a loan. A more accurate measure of the interest borrowers pay or lenders receive is the *real interest rate*.

2. Real Interest Rate

The *real interest rate* is defined as the nominal interest rate minus the inflation rate. It is a measure of the purchasing power of interest earned or paid.

Real interest rate = Nominal interest rate – Inflation rate

EXAMPLE

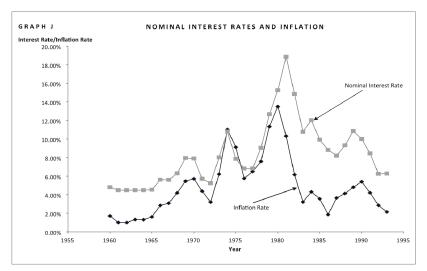
If you take out a loan with a 10% nominal interest rate and the inflation rate is 3%, then your real interest rate is only 7%. That is, after adjusting for the fact that the dollars with which you will repay the loan in the future are worth less than current dollars due to inflation, you are really only paying 7% to borrow the money.

3. Relationship between Nominal Interest Rates and Inflation

Nominal interest rates and inflation naturally move together. When the inflation rate increases, so does the nominal interest rate. The relationship between nominal interest rates and inflation may be shown by rearranging the above equation for real interest rates as follows:

Nominal interest rate = Real interest rate + Inflation

Thus, if *real interest rates* do not change, a 1 percent increase in the inflation rate will lead to a 1 percent increase in *nominal interest rates*.



Note the close relationship between nominal interest rates and the inflation rate in *Graph J*. As the inflation rate increases, the nominal interest rate also increases. Also note that about 1974/1975, the inflation rate was actually higher than the nominal interest rate, implying real interest rates were negative.

B. Definition of Money and the Money Supply

Money is the set of liquid assets that are generally accepted in exchange for goods and services. The money supply is defined as the stock of all liquid assets available for transactions in the economy at any given point in time. There are several definitions of money supply. M1 and M2 are the most common measures of money supply and are reported (periodically) in financial publications (for example, The Wall Street Journal).

1. M1

M1 is defined broadly as money that is used for purchases of goods and services. It typically includes coins, currency, checkable deposits (accounts that allow holders to write checks against interest-bearing funds within them), and traveler's checks. M1 does not include savings accounts or certificates of deposit (CDs).

2. M2

M2 is defined broadly as M1 plus liquid assets that cannot be used as a medium of exchange but that can be converted easily into checkable deposits or other components of M1. These include time certificates of deposit less than \$100,000, money market deposit accounts at banks, mutual fund accounts, and savings accounts.

3. M3

M3 includes all items in M2 as well as time certificates of deposit of \$100,000 or more.

```
EXAMPLE
Assume that at year-end, an economy had the following liquid assets (in $ billions):
                                          $10,500
   Money market deposit accounts M2
   Checkable deposits M
                                           42,100
   Certificates of deposits > $100,000 M3
                                            3,435
   Travelers checks M
                                              700
   Mutual funds M2
                                           24,650
   Currency M
                                           85,284
   Savings accounts M2
                                           37,169
Calculate the economy's M1, M2, and M3 money measures (under the U.S. definition).
M1 = Checkable deposits + Travelers checks + Currency
         $42,100 + $700 + $85,284 = $128,084 billion
M2 = M1 + Money market deposits + Mutual funds + Savings account
         $128,084 + $10,500 + $24,650 + $37,169 = $200,403 billion
M3 = M2 + Certificates of deposits > $100,000
         $200,403 + $3,435 = $203,838 billion
```

C. Monetary Policy and the Money Supply / Increase/decrease AD

Monetary policy is the use of the money supply to stabilize the economy. The Federal Reserve uses monetary policy to increase or decrease the money supply in an effort to promote price stability and full employment. Understanding the effects of changes in the money supply is important because changes in the money supply lead to changes in interest rates, changes in the price level, and changes in national output (real GDP). The Federal Reserve controls the money supply through:

1. Open Market Operations (OMO)

Open market operations consist of the purchase and sale of government securities (Treasury bills and bonds) in the open market by the Federal Reserve as a means to expand or contract the existing money supply. Open market operations is the most common method used by the Federal Reserve to impact monetary policy.

a. Increase in the Money Supply MS↑ IR↓ AD↑

When the Federal Reserve purchases government securities, it increases the money supply (that is, puts money into circulation to pay for the securities). Specifically, the money supply is increased when the Federal Open Market Committee (FOMC) of the Federal Reserve decides to purchase government securities.

b. Decrease in the Money Supply MS ↓ IR ↑ AD ↓

When the Federal Reserve sells government securities, it decreases the money supply (that is, takes money out of circulation).

2. Changes in the Discount Rate

The *discount rate* is the interest rate the Federal Reserve charges member banks for short-term (normally overnight) loans.

- a. Member banks may borrow money from the Federal Reserve to cover liquidity needs, increase reserves, or make investments.
- b. Raising the discount rate discourages borrowing by member banks and decreases the money supply. MS IR AD
- c. Lowering the discount rate encourages borrowing by member banks and increases the money supply. MS ADA
- 3. Changes in the Required Reserve Ratio (RRR)

Cannot loan

The required reserve ratio is the fraction of total deposits banks must hold in reserve.

- a. Raising the reserve requirement decreases the money supply.
- b. Lowering the reserve requirement increases the money supply.

Quantitative easing -

Fed. buys financial assets (govt. securities & other securities) from banks in order to increase money supply

D. Interest Rates and the Demand for and Supply of Money

1. Demand for Money is Inversely Related to Interest Rates

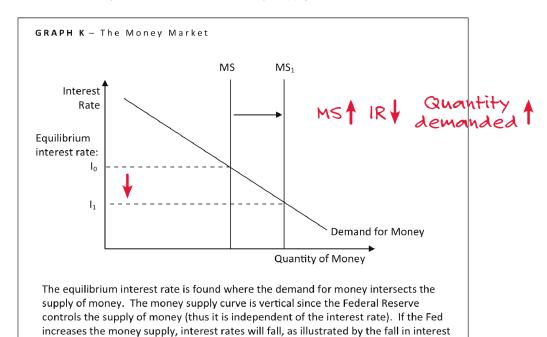
Changes in the money supply have a direct effect on interest rates because interest rates are determined by the supply of and demand for money. The demand for money is the relationship between how much money individuals want to hold and the interest rate. The demand for money is inversely related to the interest rate—as interest rates rise, it becomes more expensive to hold money (because holding money rather than saving or investing it means you do not earn interest), thus reducing the demand for money.

2. Supply of Money Is Fixed at a Given Point in Time

rates from I_0 to I_1 .

As noted above, the supply of money is determined by the Federal Reserve and is therefore fixed at any given point in time at the level set by the Federal Reserve. *Graph K* illustrates the demand for and supply of money. The intersection of the money demand curve and the money supply line determines the interest rate.

- a. An increase in the money supply will cause interest rates to fall.
- b. Conversely, a decrease in the money supply will cause interest rates to rise.



VIII. MONETARY POLICY AND ITS EFFECTS ON INTEREST RATES, THE PRICE LEVEL, OUTPUT (REAL GDP), AND UNEMPLOYMENT

When the Federal Reserve increases or decreases the money supply, it has a direct effect on interest rates and an indirect effect on the price level, real GDP, and the unemployment rate. Specifically, when the Fed changes the money supply, it causes interest rates to either increase or decrease. As we saw earlier, changes in the interest rate directly affect the cost of capital and thus shift the aggregate demand curve. Finally, shifts in aggregate demand cause changes in the price level, real GDP, and the unemployment rate.

A. Expansionary Monetary Policy (increase in the money supply)

Expansionary monetary policy results when the Fed increases the money supply, affecting the economy through the following chain of events:

- 1. An increase in the money supply causes interest rates to fall. IR
- 2. Falling interest rates reduce the cost of capital and hence stimulate the desired levels of firm investment and household consumption.
- 3. Increases in desired investment and consumption cause an increase in aggregate demand.

 GDP unemployment prices
- 4. Aggregate demand shifts to the right, causing real GDP to rise, the unemployment rate to fall, and the price level to rise.
- B. Contractionary Monetary Policy (decrease in the money supply)

Contractionary monetary policy results when the Fed decreases the money supply. The effect is the exact opposite of expansionary monetary policy. Specifically:

- 1. A decrease in the money supply causes interest rates to rise. IR
- 2. Rising interest rates reduce the desired levels of firm investment and household consumption.
- 3. Decreases in desired investment and consumption cause a decrease in aggregate demand.

 GDP

 □ unemployment

 □ prices

 □ prices □
- 4. Aggregate demand shifts to the left, causing real GDP to fall, the unemployment rate to rise, and the price level to fall.

MARKET INFLUENCE ON BUSINESS STRATEGIES

I. THE LAWS OF DEMAND AND SUPPLY

While macroeconomics focuses on how human behavior affects outcomes in highly aggregated markets (e.g., products, labor), microeconomics focuses on how human behavior affects the conduct of more narrowly defined units, including a single individual, household, or business firm. Basic principles of microeconomic theory are very important on the CPA Exam, but understanding the fundamentals is also important to the business manager. Managers are more likely to be successful if they understand how their actions and various governmental policies or collusive actions (for example, cartels) affect their market and firm. A market is simply a collection of buyers and sellers *meeting or communicating* in order to trade goods or services.

A. Demand

1. Definitions

a. Demand Curve

The demand curve illustrates the maximum quantity of a good that consumers are willing and able to purchase at each and every price (at any given price), all else being equal. Note that this demand curve is similar to the aggregate demand curve, except that the x-axis here is quantity and not real GDP. It does, however, illustrate the same kind of relationship. This demand curve is the microeconomics demand curve for a certain good or product and not the total demand in the economy as a whole.

b. Quantity Demanded Determined by price

Quantity demanded is defined as the quantity of a good (or service) individuals are willing and able to purchase at each and every (given) price, all else being equal.

c. Change in Quantity Demanded (movement along the demand curve) \triangle in Price

A change in quantity demanded is a change in the amount of a good demanded resulting solely from a change in price. Changes in quantity demanded are shown by movements along the demand curve (D). When assumptions regarding price or quantity change, the "demand point" will change along this demand curve. For example, if the price of a product increases, there will be a move up the demand curve.

d. Change in Demand (movement of the demand curve) Shift

A change in demand is a change in the amount of a good demanded resulting from a change in something other than the price of the good. A change in demand cannot be due to a change in price. A change in demand causes a shift in the demand curve.

2. Fundamental Law of Demand Downward sloping

The fundamental law of demand states that the price of a product (or service) and the quantity demanded of that product (or service) are inversely related. As the price of the product increases (decreases), the quantity demanded decreases (increases). Quantity demanded is inversely related to price for two reasons:

a. Substitution Effect

The *substitution effect* refers to the fact consumers tend to purchase more (less) of a good when its price falls (rises) in relation to the price of other goods. The substitution effect exists because people tend to substitute one similar good for another when the price of a good they usually purchase increases. For example, if the price of Pepsi-Cola decreases, it will be used as a substitute for Coca-Cola (a similar good).

h **Income Effect**

The *income effect* means that as prices are lowered with income remaining constant (i.e., as purchasing power or real income increases), people will purchase more of all of the lower-priced products. For example, a decrease in the price of a good increases a consumer's real income even when nominal income remains constant. As a result, the consumer can purchase more of all goods.

Factors That Shift Demand Curves (factors other than price)



Changes in Wealth



A positive or negative change in wealth for people will result in a shift in the demand curve. For example, if people become wealthier it may increase (shift) their demand for luxury items (e.g., high-end sports cars).

Changes in the Price of Related Goods (substitutes and complements)

If the price of a similar good (a substitute good) increases, the demand curve will shift to the right (increase) for the original good, now perceived as a bargain. If the price of a good used in conjunction with the original good (referred to as a complementary good) decreases, the demand for the original good will increase (e.g., if personal computer prices fall, demand increases for peripherals, such as monitors and laser printers). ·Complement

Changes in Consumer Income



An increase in consumers' incomes will shift the demand curve to the right (depicted as the shift from D₁ to D₂). Assume, for example, that employment in a local community is primarily retail-based. Because employees' commissions rise during the Christmas season, those employees will have additional consumer income and will demand more goods (demand curve shifts to right).

Changes in Consumer Tastes or Preferences for a Product d.

When consumers' preferences (tastes) for a given product increase or decrease, there is a shift in the demand curve. For example, if the clothing industry

experiences a revival of the 1960s era, the demand for bell-bottom jeans (retro clothing) will increase. This is also depicted as the shift from D₁ to D₂.

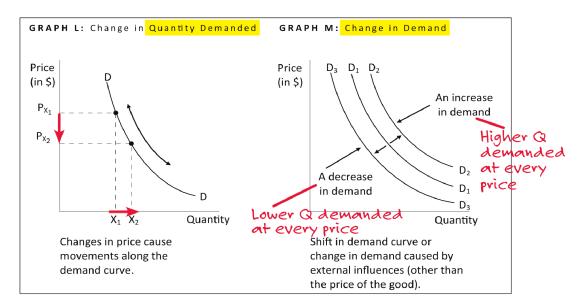
Changes in Consumer Expectations

If consumers anticipate that there will be a future price increase, immediate demand will increase for that product (at the current, lower price). For example, if commuters expect that the price of a monthly or annual bus pass will increase 10 percent in the near term, there should be a spike in demand for bus passes.

Changes in the Number of Buyers Served by the Market



An increase in the number of buyers will shift the demand curve to the right. This is evident in a community where there has been a steady rise in the population of people 65 and older. As the number of senior citizens grows, there will be more buyers of prescription drugs, resulting in a shift in the demand curve to the right.



B. Supply Opward sloping

1. Definitions

The fundamental law of supply states that price and quantity supplied are positively related (i.e., they have a positive correlation). The higher the price received for a good, the more sellers will produce (higher quantity).

a. Supply Curve

The *supply curve* illustrates the maximum quantity of a good sellers are willing and able to produce at each and every price (at any given price), all else being equal. Note that this supply curve is similar to the aggregate supply curve, except that the x-axis here is quantity and not real GDP. It does, however, illustrate the same kind of relationship. This is the microeconomics supply curve for a certain good or product and not the total supply in the economy as a whole.

- b. Quantity Supplied Determined by price
 - Quantity supplied is the amount of a good that producers are willing and able to produce at each and every (given) price, all else being equal.
- c. Change in Quantity Supplied (movement along the supply curve) \triangle in price

A change in quantity supplied is a change in the amount producers are willing and able to produce resulting solely from a change in price. A change in quantity supplied is represented by a movement along the supply curve. When price changes, there will be movement up or down the supply curve to find the new quantity that will be supplied.

d. Change in Supply (movement of the supply curve) Shift

A change in supply is a change in the amount of a good supplied resulting from a change in something other than the price of the good. A change in supply cannot be due to a change in price. A change in supply causes a shift in the supply curve.

2. Factors That Shift Supply Curves



a. Changes in Price Expectations of the Supplying Firm Sell when PA

If prices are expected to decrease, the firm will supply more now at each price level to take advantage of the currently higher prices. For example, Coffee Products Inc. produces gourmet coffee (in cans) sold primarily to the restaurant industry. Given expected favorable crop and market conditions, the company believes that the average price of gourmet coffee will decline by \$1 a can in the next six months. Based on this forecast, the company will increase the supply of gourmet coffee now to maximize profitability. This is represented by the shift in the supply curve from S_1 to S_2 .

b. Changes in Production Costs (price of inputs) Supply

When production costs are expected to decline (rise) there will be a shift in the supply curve to the right (left). A decrease in wages paid to workers would cause a shift to the right in the supply curve because for a lower amount of production dollars, the firm is willing to supply more products. This is represented by the shift in the supply curve from S_1 to S_2 .

c. Changes in the Price or Demand for Other Goods Shift from PCs to tablets

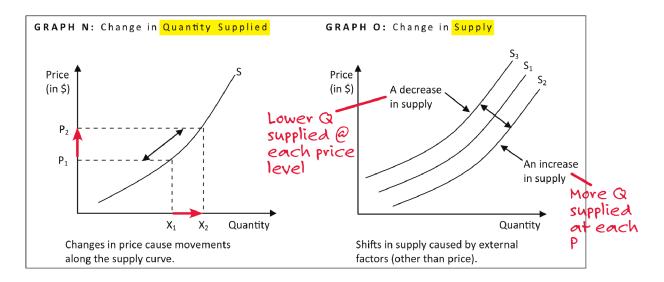
A decrease (increase) in the demand for another good supplied by a firm would cause the firm to shift its resources and increase (decrease) the supply of its remaining goods. Assume that a firm produces two products, butter and margarine. If there is an industry-wide increase in the price of butter that also lowers butter demand, the firm will shift its production to make more margarine, causing a shift in the supply curve for margarine to the right.

) d. Changes in <u>Subsidies or Taxes</u> Taxes ↓ Subsidies ↑ Supply ↑

A decrease in taxes or an increase in subsidies would increase the amount supplied at each price level. In contrast, assume that a local company produces cigarettes and that a tax is levied on the sale of cigarettes in the state. If the company believes that this tax increase will negatively affect the demand for cigarettes, it will decrease the supply of cigarettes, which will shift the supply curve to the left.

e. Changes in Production <u>Technology</u>

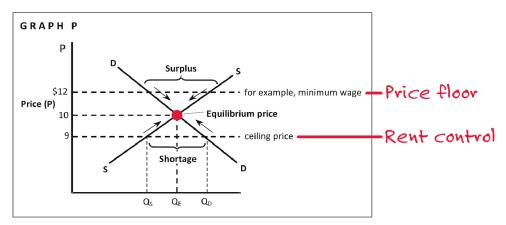
An improvement in technology would cause a shift to the right of the supply curve. For example, a company has introduced a state-of-the art technology that would significantly increase the finished bottle output for a production day. Under this scenario, the company would increase supply, resulting in a shift in the supply curve to the right.



C. Market Equilibrium

A market is in equilibrium when there are no forces acting to change the current price/quantity combination. The market supplies just as much as is demanded, and there is no pressure to change prices.

- 1. The market's equilibrium price and output (quantity) is the point where the supply and demand curves intersect. This is sometimes called the market clearing price.
- 2. The interaction of demand and supply determines equilibrium price.
- 3. Graph P illustrates equilibrium price.



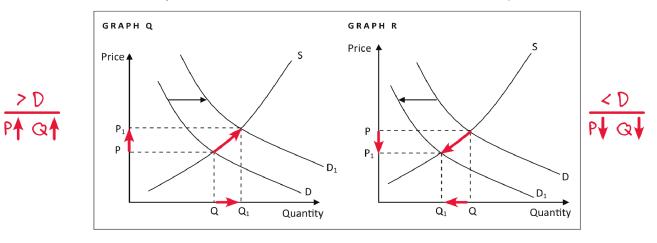
- a. As illustrated above, price (P) is \$10 at equilibrium, and the quantity supplied (Q) is $Q_{\rm E}$.
- b. If the price is set below the equilibrium price, the quantity demanded will exceed the quantity supplied, and a shortage will result. Price ceiling
- c. If the price is set above the equilibrium price, the quantity demanded will be less than the quantity supplied, and a surplus will result.

4. Changes in Equilibrium

If supply and/or demand curves shift, the equilibrium price and quantity will change.

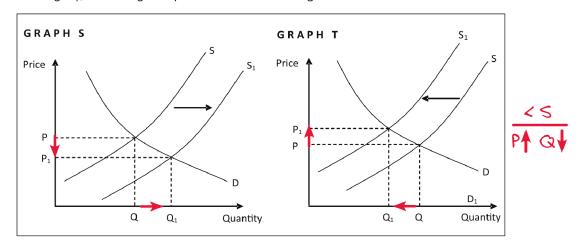
a. Effects of a Change in Demand on Equilibrium

A rightward shift (increase) in demand from curve D to curve D_1 , as shown in $Graph\ Q$, will result in an increase in price (from P to P_1) and an increase in market clearing quantity (from Q to Q_1). Conversely, a leftward shift (decrease) in demand from curve D to curve D_1 , as shown in $Graph\ R$, will result in a decrease in price (from P to P_1) and a decrease in market clearing quantity (from Q to Q_1).



b. Effects of a Change in Supply on Equilibrium

A rightward shift (increase) in supply from curve S to curve S_1 , as shown in *Graph* S, will result in a decrease in price (from P to P_1) and an increase in market clearing quantity (from Q to Q_1). Conversely, a leftward shift (decrease) in supply from curve S to curve S_1 , as shown in *Graph T*, will result in an increase in price (from P to P_1) and a decrease in market clearing quantity (from Q to Q_1). Market clearing quantity is the equilibrium quantity. Market clearing is the idea that the market will "eventually" be cleared of all excess supply and demand (all surpluses and shortages), assuming that prices are free to change





EXAMPLE

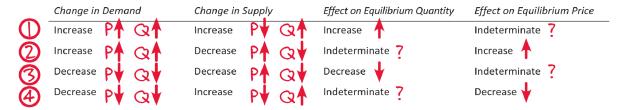
Consider the situation in the northeastern U.S. seaboard states during a recent hurricane. Prior to the hurricane, the market for generators was most likely in a state of equilibrium. However, as a result of the hurricane, residents began to demand more generators, causing a shortage. Suppliers of generators were motivated to increase the price of generators so fewer people wanted to purchase them. The price increase could potentially "clear" the market (both demand and supply), resulting in a state of equilibrium at the higher price.

c. General Effects of Changes in Demand and Supply on Equilibrium

(1) An increase in demand and supply results in an increase in equilibrium quantity, but the effect on price is indeterminate.

It is certain that the effect is an increase of equilibrium quantity (because both an increase in demand and an increase in supply cause quantity to increase), however, the effect on equilibrium price is indeterminate because an increase in demand and supply could cause an increase, decrease, or no change (if equal changes) in equilibrium price.

- (a) If the increase in demand is larger than the increase in supply, the equilibrium price will rise.
- (b) Conversely, if the increase in supply is larger than the increase in demand, the equilibrium price will fall.
- (2) The effect of other complex scenarios such as 1) a decrease in demand and an increase in supply, 2) an increase in demand and a decrease in supply, or 3) a decrease in demand and a decrease in supply, can be analyzed in a similar manner. The table below summarizes the effect of all four scenarios discussed above on equilibrium price and quantity. To understand them more fully, you should draw supply and demand diagrams for each case to verify the effects listed.



D. Government Intervention in Market Operations

Sometimes, the government will intervene in a market by mandating a price different from the "market price" (causing either a surplus or a shortage). This most often is accomplished by using *price ceilings and price floors*.

1. Price Ceilings

A *price ceiling* is a maximum price that is established *below* the equilibrium price, which causes shortages to develop. Price ceilings cause prices to be artificially low, creating a greater demand than the supply available.

2. Price Floors

A *price floor* is a minimum price set *above* the equilibrium price, which causes surpluses to develop. Price floors are minimum prices established by law, such as minimum wages and agricultural price supports.

EXAMPLE

Rent controlled apartments exist in some places. The price is required by government mandate to remain at a certain level below the market price. The result is an artificially high demand for those apartments. (There may be policy reasons for having rent controls, but the economic result is that there is a shortage of apartments.)

You can always find supporters of increasing the minimum wage in the United States. However, businesses hiring minimum-wage workers counter that they will be able to hire fewer people at the higher rates, thus creating a higher unemployment rate among those workers. Again, there is competition between the social policy and the economic policy in this case.

II. ELASTICITY OF DEMAND AND SUPPLY

Elasticity is a measure of how sensitive the demand for, or the supply of, a product is to a change in price.

A. Price Elasticity of Demand

The price elasticity of demand is the percentage change in quantity demanded divided by the percentage change in price.

1. In a normal demand curve, the price elasticity of demand is usually negative This negative price elasticity reflects the downward sloping demand curve; as price goes up (positive percentage change), the quantity demanded goes down (negative percentage change). A negative price elasticity coefficient results if the demand curve is normal.



2. Generally, the absolute value of the elasticity coefficient (positive value) is considered when elasticity problems are posed on the examination, because it is presumed that price elasticity is negative for a demand curve.

3. Measuring the Price Elasticity of Demand

The formula for price elasticity of demand follows:

$$E_p$$
 = Price elasticity of demand = $\frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$

EXAMPLE

Suppose that when the price of a product increases from \$100 to \$120, quantity demanded decreases from 1,000 units to 900 units. Using the point method, the price elasticity of demand would be:

% change in quantity =
$$\frac{900 \text{ (new demand)} - 1,000 \text{ (old demand)}}{1,000 \text{ (old demand)}} = \frac{\text{(-100) units}}{1,000 \text{ units}} = \text{(10\%)}$$

Divided by:

$$\frac{\text{\% change}}{\text{in Price}} = \frac{\$120 \text{ (new price)} - \$100 \text{ (old price)}}{\$100 \text{ (old price)}} = \frac{\$20}{\$100} = 20\%$$

$$E_p = \text{Price elasticity of demand} = \frac{(10)}{20}, \text{ or } = -.5 \text{ (absolute value} = .5)$$

4. Price Inelasticity (absolute price elasticity of demand < 1.0)

Demand for a good is *price inelastic* if the absolute price elasticity of demand is less than 1.0. The smaller the number after the minus sign, the more inelastic the demand for the good.

- a. If price inelasticity is zero, demand is perfectly inelastic. Note also that perfectly inelastic demand curves are vertical depicting that the quantity demanded stays the same no matter how the price changes (e.g., in the pharmaceutical industry, the demand for insulin by diabetics).
- b. The calculation above with a 0.5 value is an example of inelastic demand.
- 5. Price Elasticity (absolute price elasticity of demand > 1.0)

Demand is *price elastic* if the absolute price elasticity of demand is greater than 1.0. When the value is greater than 1.0 (defined as elastic), the greater the number, the more elastic the demand.

6. Unit Elasticity (absolute price elasticity of demand = 1.0)

Demand is *unit elastic* if the absolute price elasticity of demand is equal to exactly 1.0. Demand is unit elastic if the percentage change in the quantity demanded caused by a price change equals the percentage change in price.

- 7. Factors Affecting Price Elasticity of Demand
 - a. Product demand is more elastic with more substitutes available but is inelastic if few substitutes are available. (Demand for soft drinks and fast-food restaurant meals are price elastic. Purveyors of those products must be careful in raising their prices.)
 - b. The longer the time period, the more product demand becomes elastic because more choices are available.
- 8. Price Elasticity Effects on Total Revenue

If we know the price elasticity of demand for a good, we can determine how a change in price will affect a firm's total revenue. Total revenue is simply the price of a good multiplied by the quantity of the good sold.

a. Effects of Price Inelasticity on Total Revenue (positive relationship)



When demand is price inelastic, an increase in price results in a decrease in quantity demanded that is proportionally *smaller* than the increase in price. As a result, total revenue (equal to price times quantity) will increase.

b. Effects of Price Elasticity on Total Revenue (negative relationship)



When demand is price elastic, an increase in price results in a decrease in quantity demanded that is proportionally *larger* than the increase in price. As a result, total revenue (equal to price times quantity) will decrease.

c. Effects of Unit Elasticity on Revenue (no effect)

If demand is unit elastic, a change in price will have no effect on total revenue.

d. Summary Know this

The table below summarizes the relationship between the price elasticity of demand and total revenue.

Price Elasticity of Demand	Implied Elasticity	Impact of a Price Increase on Total Revenue	Impact of a Price Decrease on Total Revenue
Elastic	Greater than 1	Total revenue decreases	Total revenue increases
Inelastic	Less than 1	Total revenue increases	Total revenue decreases
Unit Elastic	Equal to 1	Total revenue is unchanged	Total revenue is unchanged

B. Price Elasticity of Supply

The price elasticity of supply is calculated the same way as the price elasticity of demand, except that we now measure the change in quantity supplied. For a given change in price

1. Formula for Price Elasticity of Supply

$$E_p$$
 = Price elasticity of supply = $\frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}}$

$$\frac{\text{EXAMPLE}}{\text{% change in quantity}} = \frac{600 \text{ (new supply)} - 500 \text{ (old supply)}}{500 \text{ (old supply)}} = \frac{100}{500} = 20\%$$
Divided by:
$$\frac{\text{% change in Price}}{\text{in Price}} = \frac{\$11 \text{ (new price)} - \$10 \text{ (old price)}}{\$10 \text{ (old price)}} = \frac{1}{10} = 10\%$$

$$E_p = \text{Price elasticity of supply} = \frac{20\%}{10\%} = 2$$

2. Price Inelasticity (supply < 1.0)

Supply is *price inelastic* if the absolute price elasticity of supply is less than 1.0. If supply is perfectly inelastic, the price elasticity of supply equals zero. Perfectly inelastic supply curves are vertical, which reflects that quantity supplied is insensitive to price changes.

3. **Price Elasticity** (supply > 1.0)

Supply is *price elastic* if the absolute price elasticity of supply is greater than 1.0.

4. Unit Elasticity (supply = 1.0)

Supply is *unit elastic* if the absolute price elasticity of supply is equal to 1.0.

- 5. Factors Affecting Price Elasticity of Supply
 - a. The feasibility of producers storing the product will affect the price elasticity of supply. For example, a product that can be produced and stored until needed may have a high elasticity of supply. When the prices increase, the product is available to sell. Perishables, such as fresh flowers, cannot be stored for very long and may have a low elasticity because it is more difficult to increase supply when the prices rise.
 - b. The time required to produce and supply the good will affect the price elasticity of supply. For example, longer production time leads to lower price elasticity.

C. Cross Elasticity

Cross elasticity of demand (or supply) is the percentage change in the quantity demanded (or supplied) of one good caused by the price change of another good. A producer of butter might want to know the cross elasticity of demand or supply for margarine.

 C_e = Cross elasticity of demand/supply $= \frac{\% \text{ change in number of units of X demanded (supplied)}}{\% \text{ change in price of Y}}$

1. Substitute Goods (positive) coefficient)

If the coefficient is positive (i.e., the price of Product A goes up, causing the demand for Product B to go up), the two goods are substitutes (people stop buying the higher-priced goods and begin to buy the substitute). For example, some consumers would consider ground beef and ground turkey to be substitutes.

2. Complement Goods (negative coefficient)

If the coefficient is negative (i.e., an increase in the price of Product A results in a decrease in quantity demanded for Product B), the commodities are complements. For example, peanut butter and jelly are complementary goods (assuming you like PB&J sandwiches.) Printers and ink cartridges are complementary goods.

3. If the coefficient is zero, the goods are unrelated.

EXAMPLE

The table below indicates how the price of sirloin steak will affect the quantity of steak sauce demanded (sold) at a local supermarket in a given week. What is the cross-elasticity of demand for steak sauce if the price of sirloin steak (per pound) is increased from \$6.50 to \$7.00 this week (and the supermarket only carries sirloin steak and no hamburger)?

Price (lb.) Sirloin Steak	Quantity Steak Sauce Sold
	34400 3014
\$6.00	80
\$6.50	60
\$7.00	38
\$7.50	23

C_{Sauce Steak} = Cross elasticity of demand/supply of steak sauce

 $= \frac{\% \text{ change in quantity demanded of sauce}}{\% \text{ change in price of steak}}$

% change in quantity demanded of sauce = (38 - 60) / 60 = -0.3667

% change in the price of steak = (\$7.00 - \$6.50) / \$6.50 = 0.0769

Cross elasticity of demand/supply of steak sauce = -0.3667 / 0.0769 = -4.77

Interpretation: The cross elasticity is negative; the goods are complementary.

D. Income Elasticity of Demand

The *income elasticity of demand* measures the percentage change in quantity demanded for a product for a given percentage change in income.

I_e = Income elasticity of demand∕supply $= \frac{\% \text{ change in number of units of X demanded}}{\% \text{ change in income}}$

1. Positive Income Elasticity (normal good)

If the income elasticity of demand is *positive* (e.g., demand increases as income increases), the good is a normal good. A *normal good* is a product whose demand is positively related to income. As income goes up, demand for normal goods increases (e.g., premium foods such as steak and lobster).

2. Negative Income Elasticity (inferior good)

If the income elasticity of demand is *negative* (e.g., demand decreases as income increases), the good is an inferior good. An *inferior good* is a product whose demand is inversely related to income (opposite of a normal good). As income goes up, demand for inferior goods decreases (e.g., generic-labeled vegetables or hamburger).

EXAMPLE



Using the data above, calculate the income elasticity of demand for sporting events attended in a year in which income increases from \$100,000 to \$120,000.

 $I_{\rm e}$ = Income elasticity of demand for attendance at sporting events

 $\underline{\%}$ change in quantity demanded of sporting events

\$140.000

% change in income

% Change in quantity demanded = (9-5)/5 = 0.8

% Change in income = (\$120,000 - \$100,000) / \$100,000 = 0.2

Income elasticity of demand for sporting events = 0.8 / 0.2 = 4

Interpretation: Income elasticity of demand is positive; this is a normal good

III. PRODUCTION COSTS IN THE SHORT RUN

Economists differentiate between the short run and the long run. The short run is a period of time in which some of the inputs used for production are fixed. In the short run, some of the economic costs are fixed because the inputs are fixed. The long run is a period of time in which all of the inputs used for production are variable. In the long run, all costs have the opportunity to change, even capital costs. Thus, in the long run, all costs are variable.

A. Production Measures

Production measures are used by companies to evaluate optimal production levels based on available inputs. When compared to the corresponding prior year's measures, production measures can be used to determine whether there were year-to-year production gains based on a total amount produced or the level of input required. Further, these measures may be included in the formula for a production manager's compensation package (e.g., a 5 percent increase in total product results in a \$10,000 salary increase). The three main production measures are:

1. Total Product

Total product (TP) equals the total amount of output (Q) produced.

2. Marginal Product

Marginal product (MP) equals the change in total product resulting from a one-unit increase in the quantity of an input employed. For example, the marginal product of labor (L) is:

 $MPL = \Delta TP / \Delta L$

3. Average Product

Average product (AP) equals the total product divided by the quantity of an input. For example, the average product of labor (L) is:

APL = TP / L

B. Law of Diminishing Returns

One of the main economic concepts that governs production is the *law of diminishing returns*. It states that when more and more units of an input are combined with a fixed amount of other inputs, output increases but at a diminishing rate. For example, adding additional workers to the production process, while holding the amount of other inputs constant, causes output to increase at a decreasing rate.

C. Cost Functions

The four major cost functions used to analyze and forecast are:

1. Average Fixed Cost

Average fixed cost (AFC) equals total fixed costs (FC) divided by quantity (Q).

AFC = FC / Q

2. Average Variable Cost

Average variable cost (AVC) equals total variable cost (VC) divided by quantity.

AVC = VC / Q

3. Average Total Cost

Average total cost (ATC), or unit cost, equals total (fixed plus variable) costs (TC) divided by quantity.

ATC = TC / Q

EXAMPLE

Widget Company sold 6,000,000 widgets, resulting in net sales of \$150,000,000 for the current year. Operating costs for the year included raw material costs of \$36,000,000, direct labor of \$47,000,000, officers' salaries of \$6,000,000, electricity cost used in the production of \$1,000,000, and factory depreciation expense of \$1,200,000.

Calculate the average fixed cost (AFC), average variable cost (AVC), and average total cost incurred by the company during the year.

Solution

The fixed costs include:

 Office salaries
 \$6,000,000

 Depreciation
 1,200,000

 Total fixed costs
 \$7,200,000

AFC = FC / Q

= \$7,200,000 / 6,000,000 widgets

= \$1.20

The variable costs include:

 Raw materials
 \$36,000,000

 Direct labor
 47,000,000

 Electricity
 1,000,000

 Total variable costs
 \$84,000,000

AVC = VC / Q

= \$84,000,000 / 6,000,000 widgets

= \$14

The total costs are \$91,200,000 consisting of the sum of fixed (\$7,200,000) and variable (\$84,000,000) costs.

ATC = TC / Q

= \$91,200,000 / 6,000,000 widgets

= \$15.20

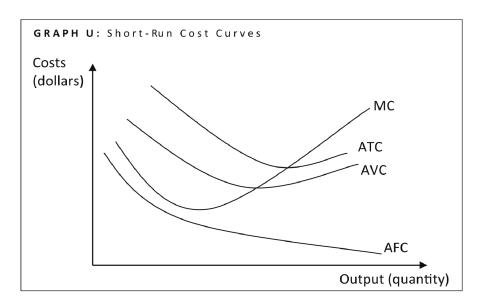
4. Marginal Cost

Marginal cost (MC) (incremental cost) is the change in total cost associated with a change in output quantity over a period. For example, the marginal cost of the 10th unit is the total cost of producing 10 units less the total cost of producing 9 units (the difference between the total cost of each). Marginal cost, or incremental cost, equals the change in total cost, resulting from a one-unit increase in quantity.

 $MC = \Delta TC / \Delta Q$

- a. Marginal cost depends solely on variable costs.
- b. Fixed costs do not influence marginal costs.

D. Illustration and Analysis of Short-Run Cost Curves



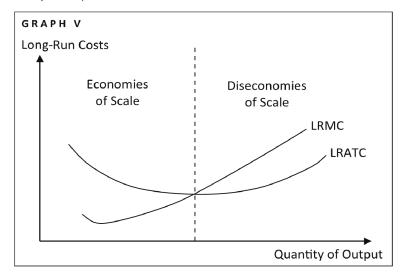
- 1. The average fixed cost (AFC) curve decreases continually over the range of quantity produced (as output increases).
- 2. ATC is the sum of AFC and AVC. Thus, the vertical distance between the AVC curve and the ATC curve is equal to AFC.
- 3. The average total cost (ATC) curve is U-shaped. At low levels of output, average total costs are high because average fixed costs are high. As output increases, average fixed costs fall and thus average total costs fall. However, as output continues to increase, marginal costs and average costs start to increase, causing average total costs to rise.
- 4. The marginal cost (MC) curve intersects the AVC and ATC curves at their minimum points.
- 5. The short-run supply curve is the marginal cost (MC) curve above the minimum point of its average variable cost (AVC) curve.

IV. PRODUCTION COSTS IN THE LONG RUN

- A. In the long run, all resource inputs are variable.
- B. To be in position to produce at the lowest possible cost means adjusting the scale of production by adjusting plant size or numbers of plants.
- C. Generally the long-run average total cost (LRATC) curve is U-shaped. Therefore, the optimal size or number of plants is at the minimum point of the LRATC curve.

D. Long-Run Cost Graph

Graph V illustrates the long-run average total cost (LRATC) curve and the long-run marginal cost (LRMC) curve.



E. Economies of Scale

Companies that are able to reduce per-unit costs by using large plants to produce large amounts of output are said to have economies of scale. Economies of scale are reductions in unit costs resulting from increased size of operations. In the long run, economies of scale will cause the long-run average total cost (LRATC) curve to decline within the range of production. Economies of scale will eventually be lost, and diseconomies of scale will result (see *Graph V*). Factors enabling economies of scale (increases in the productivity of inputs) include:

- 1. Opportunity for specialization.
- 2. Utilization of advanced technology.
- 3. Mass production is normally more efficient.

EXAMPLE

A local farming community in the Midwest has two primary grocery stores including Meyers Foods and Cindy's Corner Groceries. Because Meyers is a national grocery store chain, it has economies of scale related to wholesale product purchases, distribution, and back-office functions (e.g., sales and accounting). In contrast, Cindy's pays premium prices for its wholesale goods purchased, has higher in-store overhead, and must pay a higher per diem rate for its advertisements published in local papers. Due to Meyers' economies of scale in product purchases, distribution, and back-office functions, the national grocery store is able to offer overall lower food prices to its customers. To compete in the local market with Meyers, Cindy's relies on superior customer service, which includes in-home delivery to the elderly.

F. Diseconomies of Scale

Diseconomies of scale may occur when these large firms become inefficient and are no longer cost productive. Diseconomies of scale are increases in average costs of operations resulting from problems in managing large-scale enterprises. For example, diseconomies of scale can also cause workers to feel disassociated from the firm with a resulting lack of motivation. Factors causing diseconomies of scale include:

- 1. Bottlenecks and costs of transporting materials.
- 2. Difficulty of supervising and managing a large bureaucracy (reasons for diseconomies of scale for the firm result almost entirely from the inefficient performance of the management function).

V. MARKET STRUCTURES AND PRICING

Operating environments influence a firm's strategic plan. Following is a brief discussion of the overall market structures in which firms may operate.

A. Perfect (Pure) Competition

In a perfectly competitive market, no individual firm can influence the market price of its product, nor shift the market supply sufficiently to make a good scarcer or more abundant.

1. Assumptions and Market Conditions

- a. A large number of suppliers and customers acting independently. Firms are small relative to the industry.
- b. No barriers to entry because firms exert no influence over the market or price (thus, goods and services are produced at the lowest cost to the consumer in the long run).
- c. Very little product differentiation (homogeneous products).
- d. Firms are price takers. Price is set by the market.
- e. Firms control only the quantity produced. Each firm can sell as much or as little as it wants at the given market price.
- f. Demand is perfectly elastic.
- g. Because there are no barriers to entry, the entry and exit of new firms ensures that economic profits are zero in the long run; thus, firms earn a normal rate of return.

2. Strategies Under Perfect Competition

Under *perfect competition*, strategic plans may include <u>maintaining the market share and</u> responsiveness of the sales price to market conditions.

B. Monopolistic Competition

Monopolistic competition exists when many sellers compete to sell a differentiated product in a market into which the entry of new sellers is possible (e.g., brand-name cosmetic products).

1. Assumptions and Market Conditions

- a. Numerous firms with differentiated products. Firms are small relative to the industry.
- b. Few barriers to entry.
- c. Firms exert some influence over the price and market through differentiation, but have more control over quantity produced than over price.
- d. Differentiation results in a highly elastic but downward-sloping demand curve.
- e. Because there are few barriers to entry under monopolistic competition, in the long run monopolistically competitive firms will earn zero economic profits. If profits are positive in the short run, more firms will enter and drive profits down to zero. If firm profits are negative in the short run, firms will exit and drive profits up to zero.

2. Strategies Under Monopolistic Competition

Under *monopolistic competition*, strategic plans may include <u>maintaining the market share</u> (as with pure competition) but will also likely include a plan for <u>enhanced product differentiation and extensive allocation of resources to advertising, marketing, product research</u>, etc.

C. Oligopoly

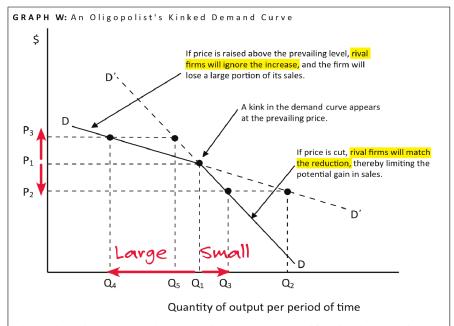
An oligopoly is a market structure in which a few sellers (e.g., the "Big Three" U.S. automotive manufacturers) dominate the sales of a product and entry of new sellers is difficult or impossible.

1. Assumptions and Market Conditions

- a. Relatively few firms with differentiated products. Firms are large relative to the industry.
- b. Fairly significant barriers to entry (e.g., high capital cost of designing a safety-tested car and building an auto plant).
- c. Products are differentiated and firms have control over both the quantity produced and the price charged.

* d. Strongly interdependent firms.

- e. Oligopolists face a kinked demand curve because firms match price cuts of competitors but ignore price increases. This causes the demand curves to have different slopes above and below the prevailing price.
- f. Because of high barriers to entry, economic profits are positive in the long run.



The matching of price cuts and the ignoring of price increases by rival firms has the effect of making an oligopolist's demand curve highly elastic above the ruling (prevailing) price. This causes the demand curve to be kinked, illustrating that there is not a direct relationship between price and quantity at all points on the demand curve. Firms would be foolish to engage in price cutting because rivals merely match the price reduction (e.g., the airline industry).

2. Strategies Under Oligopoly

Under an oligopoly, strategic plans focus on market share and call for the proper amount of advertising (to ensure appropriate product differentiation) and ways to properly adapt to price changes or required changes in production volume.

D. Monopoly

Monopoly (e.g., the classic utility company, which was a "regulated" monopoly) represents concentration of supply in the hands of a single firm.

1. Assumptions and Market Characteristics of Monopoly

- a. A single firm with a unique product.
- b. Insurmountable barriers to market entry.
- c. Monopolies are "price setters," as opposed to firms in perfect competition (which are "price takers"). The firm sets both output and prices (e.g., through patents or regulatory restrictions against competition).
- No substitute products (the firm's demand curve is the same as the industry's demand curve). Demand is inelastic.
- e. Because of insurmountable barriers to entry, economic profits are positive in the long run.

2. Strategies Under Monopoly

Under a *monopoly*, strategic plans will likely <u>ignore market share</u> and <u>focus on profitability</u> <u>from production levels that maximize profits</u>.

EXAMPLE-MARKET STRUCTURE

ABC Company ("ABC") and XYZ Company ("XYZ") operate in different industries. ABC is a relatively small firm in the men's clothing industry that focuses on the young men's niche by continuously producing and offering new fashion items to its retail customers. Although ABC has significant control over the quantity of fashion items produced, the pricing of these products to its retail customer base is more a function of the market.

XYZ manufactures hub caps and wheel covers for the U.S. auto industry. XYZ is one of many competitors in this industry, in which the standard products offered are commodity-like and the prices offered to wholesalers for its products are driven entirely by market forces. XYZ's management continues to be concerned about the expansion of firms competing against XYZ in this industry.

Question 1: What is the most likely market structure for ABC and XYZ?

Question 2: Identify one characteristic that is common to both ABC and XYZ.

Question 3: Indicate a market strategy that should be used by ABC and XYZ.

Solution 1

The market structures for ABC and XYZ are monopolistic competition and perfect competition, respectively.

Solution 2

Both ABC and XYZ would seek a zero economic profit over the long run.

Solution 3

ABC's market strategy would focus on maintaining its market share primarily through continued enhanced product differentiation. XYZ would also focus on maintaining its market share despite a continued saturation of new firms entering this market. To accomplish this, XYZ needs to ensure that its pricing of its products continuously responds to existing market conditions.

E. Market Assumptions and Conditions

- 1. Regardless of the model that represents the industry, the firm will operate best when marginal revenue equals marginal cost (MR = MC).
- 2. Microeconomic theory holds that firms make decisions based on marginal cost and marginal revenue (essentially ignoring fixed or sunk costs).
- 3. The following table summarizes the market assumptions and conditions underlying perfect competition, monopolistic competition, oligopoly, and monopoly.

*Know for exam

MARKET STRUCTURE							
Characteristic	Perfect Competition	Monopolistic Competition	Oligopoly	Monopoly			
Number of firms in the industry	Many (Highly competitive)	Many (Highly competitive)	Few (Moderately competitive)	One (No competition)			
Size of firms relative to industry	Small	Small	Large	100% of industry			
Barriers to entry	None (Easy to enter industry)	Low (Easy to enter industry)	High (Difficult to enter industry because of economies of scale)	Insurmountable (No entry is possible)			
Differentiation of product	None (All firms sell the same commodity product)	Some (Firms sell slightly different products that are close substitutes)	Various (Firms usually sell differentiated products)	None (One firm sells only one product)			
Firm's control over price and quantity	Firm has control over quantity produced only; price is set by the market, firm must accept the market price	Firm has control mostly over quantity produced; price is primarily set by the market	Firm has control over both the quantity produced and the price charged	Firm has control over both price and quantity			
Elasticity of demand	Perfectly elastic (Firm sells as much, or as little, as it wants at the given market price)	Highly elastic but downward sloping (Firm can adjust quantity of products sold without affecting the price very much)	Inelastic (Firms face a kinked downward-sloping demand curve)	Inelastic (Firm faces the entire demand curve for the product, which slopes downward)			
Long-run profitability	Zero economic profit	Zero economic profit	Positive economic profit	Positive economic profit			
Strategies	Maintaining market share and responsiveness of sales price to market conditions	Maintaining market share, enhanced product differentiation, and allocation of resources to advertising, marketing, and product research.	Maintaining or enhancing market share, proper spending on advertising, and proper adaptation to price changes and changes in production volume.	Ignore market share and focus on profitability from production levels that maximize profits.			

VI. THE ECONOMY AS A SYSTEM OF MARKETS

A. Production and Demand for Economic Resources

1. Factors of Production (resources) Labor (human capital), land, capital

Businesses use resources to make final products. The primary resources from which final products are made consist of *land* (natural resources), *labor* (human capital), and *capital* (nonhuman physical capital accumulated through past investment). These resources are known as *factors of production*. Factors of production are bought and sold in markets just as final goods and services are bought and sold in markets.

- a. To maximize profits, firms need to decide on the optimal levels of inputs to employ.
- b. The price firms must pay for the factors of production is determined by the interaction of supply and demand in the input market.

2. Types of Inputs

a. Complementary Inputs

Inputs are *complementary inputs* if an increase in the usage of one input results in an increase in the usage of the other input.

EXAMPLE

A firm opens two new factories (capital) and will also need to hire more employees (human capital).

b. Substitute Inputs

Inputs are *substitute inputs* if an increase in the usage of one input results in a decrease in the usage of the other input.

EXAMPLE

A firm that invests in production line automation (capital) may need fewer employees (human capital).

3. Derived Demand

Derived demand is the demand for factors of production. A firm's demand for inputs is derived from its decision to produce a good or service. Therefore, the demand for inputs is directly related to the demand for the goods and services those inputs produce.

a. Demand for Inputs Depends on Demand for Outputs

The demand for any input depends on the demand for the product the input produces (i.e., the firm's output) and the marginal product of the input itself. (Recall that marginal product (MP) is the change in total product resulting from a one-unit change in an input.)

- (1) If the demand for a firm's output increases, the demand for the inputs used to produce that output will also increase.
- (2) Similarly, if the marginal product of an input increases, the demand for that input will also increase.

b. Examples

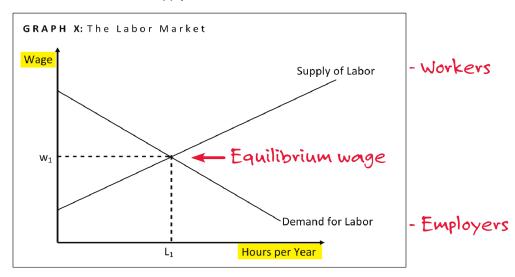
- (1) The demand for labor is directly related to the demand for the goods and services that labor produces.
- (2) If the demand for medical services increases, the derived demand for doctors, nurses, and medical equipment will also increase.

B. The Labor Market

In modern economies, workers sell their services to employers in labor markets, where workers independently offer skills of a given quality to employers who compete for the workers' services. Just as in any other market, the supply of labor and demand for labor determines the price, or wage, of workers. Thus, in the labor market, wages are the price paid for labor. The laws of demand and supply prevail in labor markets as they do in product markets. The lower the wage, the greater the quantity of labor service demanded by employers.

1. Illustration

Graph X illustrates equilibrium in the labor market. The equilibrium wage depends on the supply of and demand for labor. The equilibrium wage is found where the demand curve for labor intersects the supply curve for labor.



2. Labor Demand and Supply Under Monopsony

A *monopsony* occurs when there is only one employer in a market. For example, if a town contains a single firm, that firm is known as a monopsonist. Much like a monopolist has market power in the product market, a monopsonist has market power in the input (labor) market. Relative to a purely competitive labor market, a monopsony results in lower wages and lower levels of employment.

3. Unions and Wages

a. Effect on Unionized Workers

By forming a union and acting collectively, workers gain market power much in the same way that a monopoly or cartel has market power. The union may use its market power to bargain collectively for higher wages or restrict the supply of labor. As a result, wages of unionized workers increase.

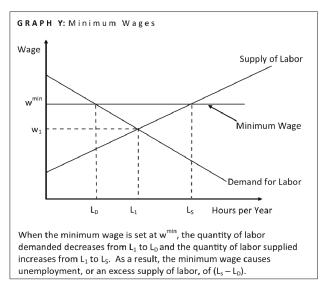
b. Effect on Nonunionized Workers

Unions may also affect the wages of nonunionized workers. Suppose there are two worker sectors in an economy, one unionized and the other not. Because employment falls in the unionized sector, displaced workers may seek employment in the nonunion sector. As a result, wages in the nonunion sector may fall as the supply of labor in that sector increases. Thus, while wages rise in the unionized sector, they may fall in the sector that is not unionized.

4. Minimum Wage Laws

The use of minimum wage laws to increase the wages of low-skilled labor is controversial. If the minimum wage is set above the equilibrium wage, an excess supply of labor will result. In other words, if the minimum wage is above the equilibrium wage, the result is unemployment.

Furthermore, the imposition of a minimum wage increases the income of those workers who have a job, but it decreases the income of workers who find themselves unemployed as a result of the imposition of the minimum wage. The effect of a minimum wage is illustrated in *Graph Y*.



VII. FACTORS THAT INFLUENCE STRATEGY

When determining the effects of the market on business strategy, a look at the overall macroenvironment in which the firm operates is essential because it can significantly assist the company in developing and choosing the best strategy to meet its goals.

A. Two General Types of Factors That Influence Strategy

Firms use SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis to assist in developing their appropriate strategic plans. Any strategy must consider these factors in its development.

1. **Internal** Factors srengths and weaknesses SW

Factors internal to the organization that impact strategy are sources of strengths and weaknesses and include:

- a. Innovation of product lines.
- b. Competence of management.

- c. Core competencies (outstanding skills that are better than those of the competitors).
- d. Influence of high-level managers.
- e. Capital improvements.
- f. Leadership in research and development.
- g. Cohesiveness of the values of the organization.
- h. Marketing effectiveness.
- i. Effectiveness of communication.
- j. Clarity of the strategic mission.
- 2. External Factors Opportunities and threats)

Factors external to the organization are sources of opportunities in the market and threats to the firm's ability to continue with its strategic plan.

a. Factors That Affect the Overall Industry and Competitive Environment of the Industry

- (1) The economy
- (2) Regulations and laws
- (3) Demographics of the population
- (4) Technological advances and existing technology
- (5) Social values
- (6) Political issues

b. Factors That Affect the Competitive Environment of the Firm

- (1) Barriers to market entry
- (2) Market competitiveness
- (3) Existence of substitute products
- (4) Bargaining power of the customers
- (5) Bargaining power of the suppliers

Porter's 5 Forces

EXAMPLE

Diverse Company (DC) is an international firm that produces bottles and pumps for its three distinct business segments, including food, healthcare, and fragrance. The following SWOT analysis was prepared by an equity analyst to further understand the factors which affect the company's business strategy.

Strengths (S): Diverse Company has developed strong business relationships in many of its international markets, which has resulted in steadily increasing market shares for its product offerings. The company has been successful in implementing production efficiencies, which has led to improved operating margins.

Weaknesses (W): Despite its diversification, the company has significant exposure to the European market, which has been in a recession. The company's net earnings are also subject to foreign-exchange risk (exposure) as DC has operations in 12 countries.

Opportunities (**O**): There has been increased demand for personal healthcare products in emerging market countries. Although DC currently has limited product sales to emerging markets, management considers this a significant opportunity to expand its global market share.

Threats (T): While barriers to entry in the company's product markets are moderate, DC will have to increase its already significant investment in R&D to maintain its customer base. These additional operating costs, along with expected further compliance and regulatory costs, may erode the company's impressive operating margins.

B. Five Forces That Affect the Competitive Environment (and Profitability) of the Firm (Michael Porter, 1980 and 1985)

The following five forces have a significant effect on the competitive environment and profitability of the firm.

1. Barriers to Entry Low → more competitive

The firm faces the threat of new firms entering the market in which it operates.

a. Types of Barriers to Entry High < oligopoly

Often, rival firms face barriers to entry in the form of government regulation, supplier access, high up-front capital requirements, preexisting customer preferences and loyalties, economies of scale, learning-curve issues, and other up-front competitive cost disadvantages, including patents, trade barriers, and other restrictions.

b. When New Companies Will Attempt to Enter Low Perfect competition

New companies will attempt to enter the competition when barriers to entry are low, potential high profits exist in the market, and the risk of retaliation by other firms is low. If the industry as a whole is earning a profit, other firms will desire to enter the market. Unless barriers to entry exist, firms will enter until profits fall to a competitive level. It is also possible that the simple threat of new entrants will scare existing firms into keeping their prices at competitive levels.

2. Market Competitiveness (intensity of competition)

The existence of competition from rival firms is often the most significant of the five forces of competition.

a. Ability of Rival Firms to Respond to Change

If a firm is in competition with other firms that are all able to respond to changes in various components affecting business (e.g., regulation, input costs, labor issues, technology changes, consumer desires for improved quality and service, etc.), the firm faces a strong competitive force.

b. Advertising of Rival Firms

If rival firms are likely to spend large amounts of money on advertising aimed at changing customer preferences and creating loyalty, the impact of this competitive factor is increased.

c. Research and Development of Rival Firms

When rival firms spend large amounts of money on research and development to improve their products or create innovations in technology, the effect of this competitive factor is increased.

d. Alliances of Rival Firms and Suppliers

Often, rival firms focus on developing strong alliances with suppliers. This could affect the firm's ability to obtain its inputs to the production process at advantageous prices and, thus, reduce its competitive advantage. When alliances are created, the impact of this competitive factor is increased.

High→
more
competitive

e. Other Factors Increasing Competition

Competition becomes an even stronger force affecting the firm when: the market is not growing fast (in contrast, in fast-growing markets, competitors are usually able to sustain profitability without having to take market share from their rivals); several equal-sized firms exist in the market; customers do not have strong brand preferences; the cost of exiting the market exceeds the cost of continuing to operate; some firms profit from making certain moves to increase market share; and the various firms employ different types of strategic plans.

3. Existence of Substitute Products Elasticity ↑: price ↑ profits ↓

If the firm faces heavy competition from substitute products, the ability of a firm to sustain profits is significantly affected by the maximum amount that buyers are willing to pay for a product. This is especially true if the substitutes are readily available to consumers, have equal performance, and are priced at or below the price of the firm's product. The effect is further intensified when the costs of the buyer switching to the substitute product are low. If few substitutes exist, buyers have little choice of products and may be willing to pay a higher price for the products that are available. If close substitutes exist, buyers may have a limit on the maximum price that they are willing to pay, and this has a direct effect on the profits of the firm.

EXAMPLE

Both Chevrolet and Ford have strong market positions in the U.S. pickup truck market. If Ford is able to lower its model prices due to increased efficiencies in its production process, and consumers view their pickup truck models as comparable, there is a legitimate threat that Chevrolet could lose market share because switching costs are virtually nonexistent.

Customers

Bargaining Power of the Customers

If buyers are in the position to bargain with suppliers on the conditions of service, price, and quality, they are a strong force in the competitive market in which the firm operates. For example, Wal-Mart Stores, Inc., is a retailer that is known to have a strong position when it comes to bargaining with its suppliers.

Buyers may be quite price sensitive and change products solely based on price, or they may have such brand loyalty and strong preferences that they will stay with a product regardless of price (oftentimes depending on the elasticity of demand).

a. Large Volume of a Firm's Business (high buyer concentration)

If one group of customers makes up a large volume of the firm's business, the bargaining power (negotiating power) of the customer will significantly affect the competitive environment of the firm, and the strategy of firms should focus on pleasing this group of customers.

b. Availability of Information

The more information that is available to the buyer, the more the buyer will be able to compare and contrast features of a product and choose one over the other.

Buyer's Low Cost of Switching Products C.

If the costs of switching from one product to another are low, the impact of the effect on the competitive environment from buyers is increased. This result is intensified if the firm cannot easily change production without incurring high costs to begin producing another product.

d. **High Number of Alternative Suppliers**

When many suppliers exist to serve the customers, the bargaining power of the buyer is increased.

Bargaining Power of the Suppliers ↑ Cost ↑ profits ↓ 5.

When the bargaining power of the suppliers of inputs to the production process is high, suppliers can take profits away from a firm simply by increasing the cost of the inputs to the firm's production process.

Firm Is Unable to Change Suppliers

If the firm is unable to use different suppliers or cannot change its inputs (i.e., no substitutes are available), changes in the operations of the supplier, and thus the price of the input, will affect the profitability of firms, especially when those input costs are a significant part of the overall product cost.

Reputation of Supplier and Demand for Its Goods b.

If the reputation of the supplier (e.g., the quality of its product) is excellent and crucial to the success of the firm's product, and the demand for its goods from other firms is high, the firm could be placed in a difficult situation, especially if the firm is not a large client of the supplier or if strategic alliances have been formed between the supplier and a competitor.



Building a successful competitive strategy requires being able to attain some sort of competitive advantage while still holding customer loyalty and having value for the customer.

Α. **Competitive Advantage in General**

The overall competitive advantage of a firm is determined by the value the firm offers to its customers minus the cost of creating that value. When firms desire to achieve competitive advantage with respect to products, there are two basic forms of advantage that they will choose from.

Cost Leadership Advantage Lower costs 1.

The cost leadership advantage stems from the fact that the buyers of the product are better off because the firm has been able to produce and sell its product for less than its rivals. If the total costs of the firm are less than those of rival firms, the firm has a competitive market advantage. This advantage may be used by the firm in one of two ways:

Build Market Share Profit through volume a.

If the firm lowers the price of its product below the price of its competitors, it may be able to gain market share by securing a larger part of the market as its customer base while still maintaining the profits that are required.

Match the Price of Rivals Profit through lower costs b.

If a firm enjoys a low-cost competitive advantage, it will be able to match the price of its rivals and, because it has overall lower total costs, beat the profitability of its rivals.

2. Differentiation Advantage (offering advantage) "Better" product

The differentiation advantage (product differentiation) stems from the fact that buyers are better off because the customer perceives the firm's product to be superior in some way to those of its rivals. Therefore, they are willing to pay a higher price for its uniqueness.

All parts of the buying decision are affected by the perceived value of the product (e.g., higher quality, timeliness of delivery, superior service, wide range of goods, fewer risks, performance measures, etc.). After the product has been differentiated, the firm must always be sure to remain profitable and recoup the cost of the "premium" included with the product. This advantage may be used by the firm in one of two ways:

a. Build Market Share Profit through volume

The firm may attempt to build market share by pricing its product below what it would charge to recoup the premium with a standard number of buyers and try to recover its costs because it captures more than an average share of the market.

b. Increase Price Profit through revenue

The firm may increase the price of its product to the point at which it exactly offsets the value the customer perceives in the product.

B. Five Basic Types of Competitive Strategies

There are five types of competitive strategies that firms can employ, including:

- 1. Cost leadership focused on a broad range of buyers.
- 2. Cost leadership focused on a narrow range (niche) of buyers.
- 3. Differentiation focused on a broad range of buyers.
- 4. Differentiation focused on a narrow range (niche) of buyers.
- 5. Best cost provider. = Cost leadership + differentiation

C. Cost Leadership Strategies

Organizations may choose to achieve their organizational missions by selling their product or service for less than any other participant in the marketplace. Cost leaders undermine the profitability of their competitors as a means of achieving overwhelming market share.

EXAMPLE

Toys-Only Company is an online toy retailer that sells toys to the mass consumer market. In order to increase its market share and to compete with the "brick and mortar" stores, the company's strategy has been focused on offering a complete line of toys at the lowest prices. This cost leadership strategy has been successful for Toys-Only given that it sells commodity-like products to the general U.S. toy retail market.

1. When Cost Leadership Strategies Work Well

Cost leadership strategies work well in markets in which buyers have large amounts of bargaining power and are able to switch between competitive products without incurring significant cost.

Such strategies also are successful in markets with heavy price competition and where firms (especially new entry firms) can influence buyers to switch to their product and then increase their customer base simply by cutting the price of the product for a period.

2. When Cost Leadership Strategies Fail

If firms focus too much on cutting costs of the current process, they may overlook technological advances that could help lower costs (especially those that rivals have latched onto) or overlook the fact that consumers may want improvements to the product or may not care as much about the existence of a lower price in the desired product.

D. Differentiation Strategies (product differentiation)

Organizations may choose to achieve their organizational missions by creating the perception that their product is better or has a unique quality that differentiates it from competitors in the marketplace. Firms that successfully differentiate their products are able to command higher prices.

EXAMPLE

Quality Bathroom Inc. sells high-end bathtubs and accessories to a regional market. Because the company offers unique features, designs, and materials, its bathtubs sell at premium prices. This strategy has been successful for the company given its ability to clearly offer value-added products (at higher prices) to its retail customer market.

1. When Differentiation Strategies Work Well

Differentiation strategies work well when customers are able to see value in a product, when the product appeals to different people for different reasons, and when the firms that are competing in the market choose different features to differentiate their products.

2. When Differentiation Strategies Fail Cost > benefit

When a firm attempts to differentiate in an area without properly assessing the requirements of the consumer for desired features and preferences, or without creating value for the consumer, a differentiation strategy can fail.

Further, firms that focus too much on one area (or the wrong area) may end up creating a product whose value does not exceed the higher price that must be charged for the feature.

If a firm is in a market in which customers do not care about differentiation, will not pay extra for unique features, and are happy with paying a lower price for a more generic product, a differentiation strategy can fail.

E. Best Cost Strategies

The best cost strategy combines the cost leadership strategy with the differentiation strategy to give customers higher value for their purchase price (i.e., a high-quality product at a reasonable price). If a firm is able to achieve the lowest cost among its closest competitors while matching them on features desired by consumers, it will succeed.

EXAMPLE

Wal-Mart Stores, Inc., is a mass merchandiser that uses a best cost strategy to increase its market share. Because of sheer economies of scale (e.g., purchasing, distribution), the company is able to offer the lowest prices on its vast product lines, which include many name brands as well as its own generic brands. Wal-Mart's business strategy continues to be focused on offering customers superior products at the overall lowest prices.

1. When Best Cost Strategies Work Well

Best cost strategies work well when generic products are not acceptable to the varied needs and preferences of the buyers but the buyers are still sensitive to the value that they are receiving for the money they are spending and the overall price they are paying.

2. When Best Cost Strategies Fail

Because the best cost strategist plays the "middle," it faces the risk of losing customers to other firms that are using cost leadership strategies or those that are specifically focused on differentiation.

F. Focus/Niche Strategies

Firms with cost leadership or differentiation strategies may choose to focus their chosen strategy on a select, small group of consumers, or a niche. Rather than having to address the needs and preferences of a broad range of consumers, these firms are able to focus on market niches where consumers have specialized needs and preferences.

EXAMPLE

All-Star Baseball Gloves Inc. makes premium baseball gloves for the collegiate/professional niche market, which includes collegiate baseball, minor league baseball, and major league teams. The company has been successful because it uses the highest-quality leather materials and includes special features in each of the player position baseball gloves it manufactures and sells to the collegiate/professional niche market.

1. When Focus/Niche Strategies Work Well

The focus/niche strategy works well, provided the niche has a large enough demand to create a profit for the firm, the firm has the proper resources to adequately serve the needs of the niche group, and when few firms are focusing in an area where others cannot compete in price or are not addressing a particular feature.

2. When Focus/Niche Strategies Fail

When other firms see that the niche has been successful for those serving it, they will attempt to enter the market as competitors and take away some of the sales of the firm, likely reducing the firm's profits and its competitive advantage. The firm also faces a risk that those consumers in the current niche may find that they actually prefer the features of products that the overall market desires. If the firm is not easily responsive to change (flexible) for whatever reason, the focus/niche strategies can fail.

IX. VALUE CHAIN ANALYSIS

Value chain analysis is a *strategic tool* that assists a firm in determining how important its value (as perceived by buyers) is with respect to the market in which the firm operates. Managers must determine the flow of activities undertaken by the organization to produce a service or product and critique the value added to the customer by each link in the value chain. Once the firm is aware of how its product is perceived, value chain analysis is invaluable in assessing the ability of the firm to obtain a competitive advantage

A. Approach of Value Chain Analysis

Firms must assess every part of the value chain to allow them to provide their customers with maximum value; they must determine the parts of the value chain that will provide them with the largest competitive advantage. Three major forms of analysis are performed.

1. Internal Costs Analysis

In order to determine the internal value-creating ability of a firm, the sources of profit and costs of the internal activities within the firm must be analyzed.

2. Internal Differentiation Analysis

The firm may analyze its ability to create value through differentiation (e.g., what are the sources of differentiation and what are the related costs?) when the customer perceives that the firm's product is superior to those of its rivals.

3. Vertical Linkage Analysis

Analyzing the vertical linkage of the firm means understanding the activities of the suppliers and buyers of the product (i.e., all links from the sources of the raw materials through the recycling and disposal of the product after use) and determining where value can be created external to the firm's operations.

B. Steps in Value Chain Analysis

There are four general steps in value chain analysis:

1. Identify Value Activities

Organizations must *identify value activities* performed as part of their business. Value activities are generally those processes that are involved with <u>designing</u>, <u>preparing</u>, <u>manufacturing</u>, and <u>delivering</u> a good or service.

2. Identify Cost Drivers Associated With Each Activity

Cost drivers represent factors that increase total cost. Identification of cost drivers assists the organization in determining those areas in which it has a competitive advantage. Organizations might also identify those areas in which outsourcing is valuable.

3. Develop a Competitive Advantage by Reducing Cost or Adding Value

a. Identify Competitive Advantage

Firms with cost leadership strategies will look at cost-saving opportunities, and firms with differentiation strategies will look at opportunities for innovation

b. Identify Opportunities for Added Value

Product innovation for those organizations depending on differentiation and reduced prices for those organizations focused on cost leadership will be the driver of this phase of value chain analysis.

c. Identify Opportunities for Reduced Cost

Analysis of the cost drivers should show where the organization is not competitive. Elimination or outsourcing of those items for which the organization is not cost competitive is generally proposed from this step in value chain analysis.

4. Exploit Linkages Among Activities in the Value Chain

Analysis of the value chain may also show synergies or connections that can be used to create greater efficiencies or greater value. Each step of the value chain should produce some value.

In some cases, that value not only benefits the specific activity in the chain, but also benefits other activities. For example, in-house customer service departments handle customer complaints in an efficient and courteous manner that establishes organizational responsiveness to the customer and creates loyalty. In-house customer service staff also can be alert for patterns of complaints that may influence product design.

EXAMPLE

Boat Motors Inc. (BMI) is a low-cost manufacturer of motor boat engines for recreational fishing boats. Company management has prepared the following value chain analysis blueprint for the upcoming operating year.

BMI Value Activities include state-of-the-art design, production of low-cost efficient engines, and superior delivery and installation of boat engines.

BMI's primary **cost drivers** are focused on using high-quality raw materials, outsourcing certain production labor costs, lowering assembly and repair costs, and minimizing delivery costs.

BMI's **competitive advantage** will focus on further lowering product costs by expanding its outsourcing of direct and indirect labor, and designing a more efficient assembly production process. Given the company's extensive trucking network, BMI will attempt to maximize its economies of scale in trucking while reducing redundancies in delivery routes.

BMI will continue to strive to **improve the linkage** of its key production functions including basic motor part production/purchases, motor design, motor assembly, and motor installation. In order to effectively reduce costs to the customer end-user, each production function will have a goal of lowering costs by a minimum of 5% in the upcoming year. The head of operations will accomplish this production goal by initiating monthly meetings between the production function department heads and holding the managers more accountable for their goal achievement by restructuring their compensation packages.

C. Global Competitive Advantage and Value Chain Analysis

Along with his "five forces" that affect the profits and competitive environment of an industry (Michael Porter, 1980 and 1985), in his work in 1990, Michael Porter focused on the competitive forces that exist globally in an effort to study the ability of a nation to attain and sustain worldwide competitive advantage. When the various parts of the value chain exist in different parts of the world, this may pose problems of costs of transportation and lack of control and communication, which can negatively affect the overall customer value.

Porter identified four major factors that impact global competitive advantage:

1. Conditions of the Factors of Production Land, labor, capital

If the nation has a strong set of factors of production (e.g., a skilled labor force) that are required in a given industry, it will fare better with regard to global competitive advantage.

2. Conditions of Domestic Demand

If the nation's domestic demand for the product is high the nation will fare better with regard to global competitive advantage.

3. Related and Supporting Industries

If suppliers of material inputs exist within the nation it may help the nation fare better with regard to global competitive advantage (unless the costs are prohibitively high). If other rival domestic firms that are competitive in the international environment exist, the nation's competitive advantage is increased.

4. Firm Strategy, Structure, and Rivalry Laws & regulations

The practices of a nation with respect to how companies are managed and organized, along with the laws of the nation that regulate the formation of companies and the intensity of rivalry among competing firms, all influence the ability of the nation to attain and sustain competitive advantage.

X. SUPPLY CHAIN MANAGEMENT/INTEGRATED SUPPLY CHAIN MANAGEMENT (ISCM)

Integrated supply chain management (ISCM) exists when a firm and the entire supply chain (producers, distributors, retailers, customers, and service providers) are able to reasonably predict the expected demand of consumers for a product and then plan accordingly to meet that demand. Integrated supply chain management is a collaborative effort between buyers and sellers.

A. Goal Is to Understand Needs and Preferences of Customers

The goal of ISCM is to better understand the needs and preferences of customers and cultivate the relationship with them. If the actual demand of the customer is met and excess supply does not exist in the market, the firm will be able to minimize costs all along the supply chain (e.g., raw materials, production, packaging, shipping, etc.).

B. Supply Chain Operations Reference (SCOR) Model Plan, source, make, deliver

The SCOR Model was developed by the Supply Chain Council, which attempted to create a generic model for supply chain analysis. The SCOR Model assists a firm in mapping out its true supply chain and then configuring it to best fit the needs of the firm. There are four key management processes or core activities pertaining to SCOR.

1. Plan

The process of planning consists of developing a way to properly balance demand and supply within the goals and objectives of the firm and prepare for the necessary infrastructure. According to the Supply Chain Council, examples of activities associated with "plan" are:

- a. Determining the demand requirements.
- b. Assessing the ability of the suppliers to supply resources.
- c. Planning the inventory levels.
- d. Planning the distribution of inventory.
- e. Planning for the purchase of raw materials.
- f. Assessing capacity concerns and capabilities.
- g. Identifying viable distribution channels.
- h. Configuring the supply chain.
- i. Managing the product's life cycle.
- j. Making make/buy decisions.

2. Source Obtain resources for production

Once demand has been planned, it is necessary to procure the resources required to meet it and to manage the infrastructure that exists for the sources. According to the Supply Chain Council, this process deals with the following types of activities:

- a. Selecting vendors.
- b. Obtaining vendor feedback and certification.
- c. Overseeing and obtaining proper vendor contracts.
- d. Collecting and processing vendor payments.
- e. Ordering, inspecting, and storing inputs to the production process.
- f. Overseeing the quality assurance process.
- g. Assessing vendor performance.

3. Make Production

The "make" process encompasses all the activities that turn the raw materials into finished products that are produced to meet a planned demand. According to the Supply Chain Council, the process includes the following types of activities:

- a. Managing the production process.
- b. Implementing changes in engineering.
- c. Requesting products for use in the production process.
- d. Manufacturing the product.
- e. Testing the product.
- f. Packaging the product.
- g. Releasing inventory for shipment.
- h. Maintaining the production equipment and the facilities.
- i. Performing quality assurance measures.
- j. Scheduling production runs.
- k. Analyzing capacity availability.

4. Deliver

The "deliver" process encompasses all the activities of getting the finished product into the hands of the ultimate consumers to meet their planned demand. According to the Supply Chain Council, this process includes the following types of activities:

- a. Managing of orders (e.g., provide quotes, grant credit, enter orders, etc.).
- b. Forecasting.
- c. Pricing.
- d. Managing transportation (e.g., freight, import/export issues, truck coordination, etc.).
- e. Managing accounts receivable and collections.
- f. Shipping of products.
- g. Labeling of products.
- h. Scheduling installation of products.
- i. Delivering the inventory according to channel distribution rules.

EXAMPLE

Steel Products Inc. (SPI) manufactures custom steel rolls and standardized cut steel sheets. Despite its relatively small size, the company uses the SCOR model to assist in its supply chain management. Key features of SPI's SCOR model are as follows:

Plan: Prior to each new operating year, the plant manager estimates specific demand for SPI's steel products. The manager then estimates year-end inventory levels for each of SPI's standardized products. Once this is determined, the manager develops a plan to purchase the generic steel inputs.

Source: The next step is for the plant manager to select the vendors for purchasing the steel inputs used for the upcoming year's production. The steel is then ordered from the vendors and then stored in the receiving section of the main plant. As part of the receiving supervisor's responsibilities, he is required to inspect the quality of each of the steel shipments and assess the dependability of each vendor.

Make: The plant manager, along with an outside consultant, assesses the current year's production process to determine if any production changes should be made for the current year. At the start of the new operating year, the company manufactures its steel products from customer orders received. As new orders are obtained from the sales department, the plant manager schedules the weekly production runs.

Deliver: Once the steel orders are completed, they are priced using a combination of market intelligence and production cost inputs. The products are then shipped using the company's semi-trailer trucks for regional orders and a national trucking company for longer-distance deliveries.

C. Benefits of Implementing Supply Chain Management

Examples of benefits derived from implementing supply chain management include:

- 1. Reduced costs in inventory management.
- 2. Reduced costs in warehousing.
- 3. Optimization of the distribution network and facility locations.
- 4. Enhanced revenues.
- 5. Improved service times.
- 6. Strategic shipment consolidation.
- 7. Reduced cost in packaging.
- 8. Improved delivery times.
- 9. Cross-docking (the minimization of handling and storage costs while receiving and processing of goods in the shortest time possible).
- 10. Identification of inefficiencies in supply chain activities.
- 11. Integration of suppliers.
- 12. Management of suppliers.

Business 6

Process and Project Management, Globalization, Financial Risk Management, Decisions, and Valuation

1.	Operations management: Process management	3
2.	Operations management: Project management	. 15
3.	Globalization and local economies	. 28
4.	Financial risk management	. 36
5.	Financial decisions	. 56
6.	Financial valuation	63
7.	Internal auditing standards	.74
8.	Class questions	83

NOTES

OPERATIONS MANAGEMENT

Process Management

I. APPROACHES, ACTIVITIES, TECHNIQUES, MEASURES, AND BENEFITS TO PROCESS-MANAGEMENT-DRIVEN BUSINESSES

A. Approaches and Techniques

1. Approaches

- a. Business process management (BPM) is a management approach that seeks to coordinate the functions of an organization toward an ultimate goal of continuous improvement in customer satisfaction. Customers are both internal and external to the organization. Process management seeks effectiveness and efficiency through promotion of innovation, flexibility, and integration with technology.
- b. Business process management attempts to improve processes continuously. By focusing on processes, the organization becomes more nimble and responsive than hierarchical organizations that are managed by function.

2. Activities

Business process management activities can be grouped into five categories: design, modeling, execution, monitoring, and optimization.

a. Design

The design phase involves the identification of existing processes and the conceptual design of how processes should function once they have been improved.

b. **Modeling**

Modeling introduces variables to the conceptual design for what-if analysis.

c. Execution

Design changes are implemented and key indicators of success are developed.

d. **Monitoring**

Information is gathered and tracked and compared to expected performance.

e. Optimization

Using the monitoring data and the original design, the process manager continues to refine the process.

3. Techniques

The general technique or approach to process management is as follows:

a. Define

The original process is defined as a baseline for current process functioning or process improvement.

b. Measure

The indicators that will show a change to the process (e.g., reduced time, increased customer contacts, etc.) are determined.

c. Analyze

Various simulations or models are used to determine the targeted or optimal improvement.

d. Improve

The improvement is selected and implemented.

e. Control

Dashboards and other measurement reports are used to monitor the improvement in real time and apply the data to the model for improvement.

4. Other Techniques and Approaches

Process management also has been commonly referred to as plan, do, check, act (PDCA).

- a. **Plan**—Design the planned process improvement.
- b. **Do**—Implement the process improvement.
- c. **Check**—Monitor the process improvement.
- d. Act—Continuously commit to the process and reassess the degree of improvement.

EXAMPLE

Brakes-Only Company (BOC) manufactures car brakes for each of the big three U.S. automakers. Over the past several years there has been an increase in the return of new brake systems by these automakers due primarily to the failure to meet all required design specifications.

In order to reverse this negative trend, the head of production at BOC has implemented the PDCA approach at the company. In the first quarter of the operating year, he designed a **Plan** to ensure that all brake specifications are carefully reviewed prior to the production and shipment processes as well as to improve the communication among internal departments through enhanced internal reporting.

During the second quarter, the production manager implemented the process (Do) at the company.

At the end of each the next two operating quarters, the production manager monitored (Check) the effectiveness of the process by comparing year-to-date brake returns to the prior year.

This process continued the following operating year with BOC achieving a 10 percent reduction in brake system returns over an eighteen month period. To further reduce the number of brake system returns, the production manager hired a full-time quality control manager. As part of his ongoing responsibilities, the quality control manager will continue to monitor (Act) the effectiveness of the process and recommend any technological improvements to the production manager.

B. **Measures**

Measures or process metrics can be financial or nonfinancial and should correlate directly to the managed process. The measures are compared to expectations to monitor progress. Examples of measures include:

1. Gross Revenue - Financial

Gross revenue is an appropriate measure for sales or other measures of revenue volume in sales-driven organizations.

2. Customer Contacts - Leads

Customer contacts can be used in sales-driven organizations.

3. Customer Satisfaction - Complaints

Organizations using relationship marketing techniques may consider *customer* satisfaction measures.

4. Operational Statistics - Time

Manufacturing operations might use *operational statistics* such as throughput times, delivery times or other logistical measures to determine the efficiency of a process.



C. Benefits

The *benefits* of a studied and systematic approach to process management allow the company to monitor the degree to which process improvements have been achieved. The benefits often mentioned for process management are as follows:

- 1. Efficiency—Fewer resources are used to accomplish organizational objectives.
- 2. Effectiveness—Objectives are accomplished with greater predictability.
- 3. Agility—Responses to change are faster and more reliable.

II. SHARED SERVICES, OUTSOURCING, AND OFFSHORE OPERATIONS

A. Shared Services

Shared services refers to seeking out redundant services, combining them, and then sharing those services within a group or organization. The distinguishing feature of shared services is that they are shared within an organization or group of affiliates.

EXAMPLE

Financial Group, Inc. is a financial services company with three distinct businesses including accounting, tax, and consulting. Currently, each of these divisions operates as a separate company having their own human resources, payroll, and legal departments. In order to more effectively manage the organization and reduce costs, the new CEO implements a shared services plan where all human resources, payroll, and legal department services will be consolidated into one centralized function. The CEO believes this shared services approach will eliminate redundant back-office functions and will reduce annual operating costs by \$750,000.

1. Implications for Business Risks and Controls

Consolidation of redundant services creates efficiency <u>but might</u> also result in the following issues:

a. Service Flow Disruption

The consolidation of work to a single location can create waste in the transition, rework, and duplication as well as increases in the time it takes to deliver a service.

b. Failure Demand

The demand for a shared service caused by a failure to do something or to do something right for a customer is called failure demand. Failure demand results when a task must be performed for a second time because it was incorrectly performed the first time.

B. Outsourcing

Outsourcing is defined as the contracting of services to an external provider. Examples might include a payroll service or even a call center to provide support or back-office services for a fee. A <u>contractual relationship</u> exists between the business and its service provider.

1. Implications for Business Risks and Controls

Outsourcing can provide for efficiencies, but there are also risks. Those risks include:

- a. Quality Risk—An outsourced product or service might be defective. Suppliers might provide substandard products or services.
- b. Quality of Service—Poorly designed service agreements may impede the quality of service.

- c. *Productivity*—Real productivity may be reduced even though service provider employees are paid less.
- d. Staff Turnover—Experienced and valued staff whose functions have been outsourced may leave the organization.
- e. Language Skills—Outsourced services may go offshore. Language barriers may reduce the quality of service.
- f. Security—Security of information with a third party might be compromised.
- g. Qualifications of Outsourcers—Credentials of service providers may be flawed.

 Offshore degrees may not include the same level of training as domestic degrees.
- Labor Insecurity—Labor insecurity increases when jobs move to an external service provider or, as a result of globalization, out of the country.

C. Offshore Operations

1. Definition

Offshore operations relate to outsourcing of services or business functions to an external party in a different country. A computer manufacturer in the United States, for example, might have its call center in India. The most common types of offshore outsourcing are:

- a. Information technology outsourcing
- b. Business process outsourcing (call centers, accounting operations, tax compliance)
- c. Software research and development (software development)
- d. <u>Knowledge process</u> outsourcing (processes requiring advanced knowledge and specialized skill sets, such as reading x-rays, etc.)

2. Implications for Business Risks and Controls

Business risks of offshore outsourcing are generally the same as outsourcing, but with greater emphasis on the lack of controls associated with proximity, as well as potential language issues.

III. SELECTING AND IMPLEMENTING IMPROVEMENT INITIATIVES

Selecting Improvement Initiatives

Rational and irrational methods may be used to select improvement initiatives.

1. Irrational

Irrational methods are <u>intuitive and emotional</u>. They lack structure and systematic evaluation. The irrational methods are based on fashion, fad, or trend. They may result from an immediate need for cost reduction, and stem from a very short-term viewpoint.

2. Rational

Rational assessments are structured and systematic and involve the following:

- a. Strategic Gap Analysis—External (environmental) assessments and internal (organizational) assessments performed to create a strategic gap analysis.
- b. Review Competitive Priorities—Review of price, quality, or other considerations.
- c. Review <u>Production Objectives</u>—Review of performance requirements.
- d. Choose Improvement Program—Decide how to proceed for improvement.

B. Implementing Improvement Initiatives

There are several crucial features of successful implementation activities.

- 1. <u>Internal Leadership</u>—Senior management must provide direction and commit resources to the implementation.
- 2. Inspections—Ongoing implementation must be monitored and measured.
- 3. Executive Support—Executive management must be visibly supportive of the initiative.
- 4. <u>Internal Process Ownership</u>—The individuals most deeply involved with process management must be committed to the need for process improvement and have the resources to carry it out. <u>Accountability</u>

IV. BUSINESS PROCESS REENGINEERING

A. Definition

Business process reengineering (BPR) refers to techniques to help organizations rethink how work is done to dramatically improve customer satisfaction and service, cut costs of operations, and enhance competitiveness. Development of sophisticated information technology systems and networks have driven many reengineering efforts.

Business process reengineering is not synonymous with business process management. Business process management seeks incremental change, while business process reengineering seeks radical changes.

B. Concepts

1. Fresh Start

The basic premise of business process reengineering is the idea that management will "wipe the slate clean" and reassess how business is done from the ground up. Reengineering uses benchmarking and best practices to evaluate success.

2. Current Status

Reengineering is not as popular as it was when introduced in the mid-1990s. The technique has been criticized for what some believe was overaggressive downsizing. In addition, the programs have not produced the benefits that were originally anticipated.

EXAMPLE

Decorations, Inc. manufactures holiday ornaments and decorative lawn figurines. Over the past several years, rising manufacturing costs have significantly eroded the company's operating profit margins. Currently, the automated manufacturing process and manual labor process represent 30 percent and 70 percent of the total production costs, respectively.

In order to combat this negative operating trend, company management hired an outside consulting firm that will consider both business process management and business process reengineering.

After performing their due diligence, the consultants recommended a business process management plan that will involve cutting 10 percent of the production workforce over the next three years and replacing 15 percent of the manual production process with newly designed machines. After severance and machine upgrade costs, it is estimated that this business process management program will reduce annual operating costs by \$1,000,000 in three years.

The consulting firm also completed a business process reengineering study (plan) that will eliminate 80 percent of the current production workforce over the next three years and fully automate the production process, with the exception of the quality control function and packaging supervision. Although the up-front costs to implement the business process reengineering program are more significant than the BPM, the BPR plan is expected to reduce annual operating costs by \$2,500,000 in three years.

The consulting firm submits both plans to company management, who must decide whether incremental change or radical change is more appropriate given the up-front costs to execute the plans and the expected annual cost savings associated with each plan.

V. MANAGEMENT PHILOSOPHIES AND TECHNIQUES FOR PERFORMANCE IMPROVEMENT

Performance improvement philosophies and techniques seek to provide the highest-quality goods and services in the most efficient and effective manner possible.

A. Just-in-Time (JIT)

Just-in-time management anticipates achievement of efficiency by scheduling the deployment of resources just-in-time to meet customer or production requirements.

1. Inventory Does Not Add Value

The underlying concept of JIT is that *inventory does not add value*. The maintenance of inventory on-hand <u>produces wasteful costs</u>.

2. Benefits

V Coses

The benefits of JIT implementation include:

- a. Synchronization of production scheduling with demand. Pull
- b. Arrival of supplies at regular intervals throughout the production day.
- c. Improved coordination and team approach with suppliers.
- d. More efficient flow of goods between warehouses and production.
- e. Reduced set-up time.
- f. Greater efficiency in the use of employees with multiple skills.

B. Quality

Nonconf.

Quality is broadly defined by the marketplace as a product's ability to meet or exceed customer expectations.

1. Quality Control Principles—Costs of Quality

The cost of quality includes costs associated with activities related to <u>conformance</u> with quality standards and opportunity costs or activities associated with <u>correcting</u> nonconformance with quality standards. "Prevention + Cure"

2. Conformance Costs

The costs of ensuring *conformance* with quality standards are classified as prevention and appraisal costs.

Conf.



. Prevention Costs

Prevention costs are incurred to prevent the production of defective units. This includes such cost elements as:

- (1) Employee training
- (2) Inspection expenses
- (3) Preventive maintenance
- (4) Redesign of product
- (5) Redesign of processes
- (6) Search for higher-quality suppliers

b. Appraisal Costs

Appraisal costs are incurred to discover and remove defective parts before they are shipped to the customer or the next department. These costs include:

- (1) Statistical quality checks
- (2) Testing
- (3) Inspection
- (4) Maintenance of the laboratory

3. Nonconformance Costs

The costs of nonconformance with quality standards are classified as internal and external costs. *Nonconformance costs* are often difficult to compute because most of these costs are in the form of opportunity costs (e.g., lost sales or reputation damage).

a. Internal Failure

Internal failure costs are the costs to cure a defect discovered before the product is sent to the customer. These costs include:

- (1) Rework costs
- (2) Scrap
- (3) Tooling changes
- (4) Costs to dispose
- (5) Cost of the lost unit
- (6) Downtime

b. **External Failure**

External failure costs are the costs to cure a defect discovered after the product is sent to the customer. These costs include:

- (1) Warranty costs
- (2) Cost of returning the good
- (3) Liability claims
- (4) Lost customers
- (5) Reengineering an external failure

4. Summary—Quality Reporting

"Cost of quality" reports display the financial result of quality. An inverse relationship between conformance and nonconformance costs exists. Increased investment in conformance costs should result in decreases in nonconformance costs, while the consequence of reduced investment in conformance costs may result in increased nonconformance costs.



Appraisal includes the costs incurred (e.g., statistical quality control, inspection and testing) to identify defective products or services.



Prevention includes the costs incurred (e.g., engineering or training) to prevent the production or delivery of defective products or services.



Internal failure is the cost of defective parts or lost production time (e.g., scrap and rework).



 $\underline{\underline{\textbf{E}}}$ xternal failure is the cost of returns and lost customer loyalty due to defective products or services.



Non-conformity

EXAMPLE

Glass Products, Inc. (GPI) experienced several internal failure costs in the past operating year, including significant production downtime and batch rework costs. Additionally, GPI had external failure costs after shipping the glass products to its customers, including material costs pertaining to product returns and lost customers.

At the beginning of the current operating year, the company's production manager was replaced. The new manager, in his first week on the job, hired a statistical quality technician to test the products as they exit the production line. The new production manager then implemented quarterly employee training, preventive maintenance measures, and weekly inspections by line supervisors. Through the first half of the year, these appraisal and prevention measures have reduced production downtime by 90 percent and have reduced the company's scrap costs by 50 percent. Due to these prevention measures, the company has also experienced fewer glass product returns and no lost customers in the current operating year.

5. Quality Control Principles—Total Quality Management

Total quality management (TQM) represents an organizational commitment to customerfocused performance that emphasizes both quality and continuous improvement. Total quality management identifies seven critical factors:

a. Customer Focus

The TQM organization is characterized by the recognition that each function of the corporation exists to satisfy the customer. Customers are identified as both external customers and internal customers.

(1) External Customers

The external customer is the ultimate recipient or consumer of an organization's product or service.

(2) Internal Customers

Each link in the value chain (and within the value chain) represents an internal customer.

EXAMPLE

Supplies inventory managers provide services to internal customers, such as production managers. A TQM organization will demand that the supplies inventory manager value the satisfaction of production managers in the timely delivery of supplies adequate to meet production requirements.

b. Continuous Improvement

Quality is not viewed as an achievement in a TQM organization. The organization constantly strives to improve its product and processes. Quality is not just the goal; it is embedded in the process.

c. Workforce Involvement—Quality Circles

TQM organizations are characterized by team approaches and worker input to process development and improvement. Small groups of workers that use team approaches to process improvement are called *quality circles*.

d. Top Management Support—Delegation and Empowerment

Top management must actively describe and demonstrate support for the quality mission of the organization. Management can communicate support by meaningful delegation of authority to quality circles and involvement of suppliers.

e. Objective Measures

Measures of quality must be unambiguous, clearly communicated, and consistently reported.

f. Timely Recognition

Acknowledgement of TQM achievements (in terms of compensation and general recognition) must occur to encourage the ongoing involvement of the workforce.

g. Ongoing Training

TQM training should occur on a recurring basis to ensure workforce understanding and involvement.

6. Quality Audits and Gap Analysis

a. **Quality Audits**

Quality audits are a technique used as part of the strategic positioning function in which management assesses the quality practices of the organization. Quality audits produce the following:

- (1) Analysis that identifies strengths and weaknesses.
- (2) A strategic quality improvement plan that identifies the improvement steps that will produce the greatest return to the organization in the short term and long term.

b. Gap Analysis

Gap analysis determines the gap or difference between industry best practices and the current practices of the organization. Gap analysis produces the following:

- (1) Target areas for improvement.
- (2) A common objective database from which to develop strategic quality improvement.

C. Lean Manufacturing

Lean manufacturing or lean production requires the use of only those resources required to meet the requirements of customers. It seeks to invest resources only in value-added activities.

1. Waste Reduction - Not quality focus

The focus of *lean* is on waste reduction and efficiency. The concept of preserving value while expending only the effort necessary is not uncommon and has a long history in business and economics. Kaizen- and activity-based management initiatives are waste reduction methodologies that use empirical data to measure and promote efficiencies.

2. Continuous Improvement (Kaizen)

"Kaizen" refers to *continuous improvement* efforts that improve the efficiency and effectiveness of organizations through greater operational control.

a. Implementing Kaizen-Based Standards

Kaizen occurs at the manufacturing stage where the ongoing search for cost reductions takes the form of analysis of production processes to ensure that resource usage stays within target costs.

3. Process Improvements/Activity-Based Management

Activity-based costing (ABC) and activity-based management (ABM) are highly compatible with process improvements and total quality management (TQM).

a. Cost Identification

Activity-based costing and management systems highlight the costs of activities. The availability of cost data by activity makes the identification of costs of quality and value-added activities more obvious.

b. Implementation

Organizations with ABC and ABM programs are more likely to have the information that they need to implement a TQM program. Process improvement results from a detailed process management program (sometimes referred to as an activity-based management system or ABM).

- (1) Process management focuses on the activities performed by an organization. The structure of the organization is designed around those processes.
- (2) Process management emphasizes continuous improvement in the efficiency of these processes.
- c. Process management incorporates many of the attributes of activity-based costing, TQM, and value chain analysis.

D. Demand Flow

Demand flow manages resources using customer demand as the basis for resource allocation. Demand flow contrasts with resource allocations based on sales forecasts or master scheduling.

1. Relationship to Just-in-Time

Demand flow is akin to *just-in-time* processes that focus on the efficient coordination of demand for goods in production with the supply of goods in production. Kanban systems, which visually coordinate demand requirements on the manufacturing floor with suppliers, are techniques used to coordinate demand flow.

2. Relationship to Lean

Demand flow is designed to maximize efficiencies and reduce waste. One-piece-flow manufacturing environments, in which components move progressively from production function to production function, benefit from demand flow ideas.

E. Theory of Constraints (TOC)

Theory of constraints states that organizations are impeded from achieving objectives by the existence of one or more constraints. The organization or project must be consistently operated in a manner that either works around or leverages the constraint.

1. Constraints

A *constraint* is anything that impedes the accomplishment of an objective. Constraints for purposes of TOC are limited in total and, sometimes, organizations may face only one constraint.

a. Internal Constraints

Internal constraints are evident when the market demands more than the system can produce.

- (1) Equipment may be inefficient or used inefficiently.
- (2) People may lack the necessary skills or mind-set necessary to produce required efficiencies.
- (3) Policies may prevent the efficient use of resources.

b. External Constraints

External constraints exist when our system produces more than the market requires.

2. Five Steps

TOC generally involves five steps:

- a. *Identification of the Constraint*—Use of process charts or interviews results in identification of the constraint that produces suboptimal performance.
- b. **Exploitation of the Constraint**—Planning around the constraint uses capacity that is potentially wasted by making or selling the wrong products, improper procedures in scheduling, etc.
- c. Subordinate Everything Else to the Above Decisions—Management directs its efforts to improving the performance of the constraint.
- d. Elevate the Constraint—Add capacity to overcome the constraint.
- e. *Return to the First Step*—Reexamine the process to optimize the results. Remain cognizant that inertia can be a constraint.

3. Buffer

The concept of *buffers* is used throughout TOC. Managers add buffers before and after each constraint to ensure that enough resources to accommodate the constraint exist. Buffers, therefore, eliminate the effect of the constraint on work flow.

EXAMPLE

Advanced Printing Company purchased several state-of-the art printing press machines in the fourth quarter of last year. Despite this significant capital investment, the company's year-to-date production output and costs have not changed. Company management attributes this production trend to several internal constraints, including a lack of sufficient training for employees operating the new printing press machines and the fact that the new machines were used inefficiently during the production process.

In order to improve the new printing press machines' productivity and generate a positive return on capital investment, management will begin scheduling periodic training sessions for operating these new machines and will hire an outside consultant to determine the most effective way to maximize productivity using the new machines. Once the study is completed, each machine line supervisor will meet with the outside consulting firm to go over the study's results, share ways to further improve productivity, and provide an effective way to monitor employees' ongoing production performance. Each Saturday after a weekly production run is completed, every machine line supervisor will be required to submit a weekly production report to the production manager, explaining any negative cost and production variances greater than 2 percent from the plan. Management believes these buffers will eliminate the internal constraints identified from the current year's operating results.

F. Six Sigma

Six Sigma anticipates the use of rigorous metrics in the evaluation of goal achievement. The program is a continuous quality-improvement program that requires specialized training. Six Sigma expands on the *Plan-Do-Check-Act* model of process management described earlier and outlines methodologies to improve current processes and develop new processes.

1. Existing Product and Business Process Improvements (DMAIC)

- a. <u>Define the Problem</u>—Based on customer comments, failed project goals, or other issues, determine the existence of a problem.
- b. Measure Key Aspects of the Current Process—Collect relevant data.
- c. Analyze Data—Examine the relationships between data elements.
- d. <u>Improve or Optimize Current Processes</u>—Use models and data to determine how the process can be optimized.
- e. <u>Control</u>—Develop a statistical control process to monitor results.

2. New Product or Business Process Development (DMADV)

- a. Define Design Goals—Design goals that are consistent with customer demands.
- b. Measure CTQ (critical to quality issues)—Analyze the value chain to determine the features that provide value to the customer and the production capabilities that are available.
- c. <u>Analyze Design Alternatives</u>—Develop different methodologies to produce the new product.
- d. <u>Design Optimization</u>—Use modeling techniques to determine optimization of the proposed process.
- e. Verify the Design—Implement and test the plan.

OPERATIONS MANAGEMENT

Project Management

I. PROJECT PLANNING, IMPLEMENTATION, AND MONITORING

A. General

1. Definitions

a. Operations Management

Operations management pertains to the ongoing production of goods and services and ensuring that a company's operations function efficiently by using the optimal resources necessary to meet the sales demand of its customers. Operations management focuses on managing the processes that transform the various inputs (e.g., raw material, labor, direct overhead) into outputs.

b. **Project**

A *project* is a temporary undertaking intended to produce a unique service, product, or result. Undertaking a project may involve a single individual, multiple individuals, a single or multiple divisions, or multiple organization units (e.g., operating companies) from multiple organizations. Unlike continuing operations, a project has a definite beginning and an end.

A project is terminated (ends) when the project's objectives have been achieved, it is determined at a given point that the project objectives cannot be met, or when management determines completion of the project is no longer necessary.

c. **Project Management**

Project management consists of five major processes carried out by a project manager tasked with balancing the needs and expectations of various stakeholders against the organization's constraints. The five major processes consist of:

- (1) Initiating
- (2) Planning
- (3) Executing
- (4) Monitoring and controlling
- (5) Closing

2. Initiating

During the initiating process phase, the project scope is defined, the project is authorized, and the initial financial resources are committed. The project charter is a document that contains a business justification to fulfill the needs and expectations of initial stakeholders by carrying out a statement of work that will achieve the project objectives. It formally establishes a partnership between the requesting organization and the receiving organization.

- a. <u>Stakeholders</u>—Stakeholders are all individuals, internal business units, and external organizations that are <u>positively or negatively affected by the project</u>. Examples include the following:
 - (1) Project team
 - (2) Sponsors
 - (3) Steering committee

- (4) Customers
- (5) Customer coworkers who will be affected by the change in customer work practices due to the new product or service
- (6) Customer managers affected by modified workflows or logistics
- b. <u>Statement of Work—Describes the product or services the project must deliver</u> at completion.

B. Planning

Planning involves all the activities necessary to further detail the scope of the project, refine the project objectives, and define the course of action required to attain the project objectives. Planning is an ongoing process throughout the life of the project, because any change that occurs subsequent to the initial plan compels the project manager to assess the change and if necessary, revise the plan. Planning activities include the following:

- 1. Develop the initial project management plan.
- 2. Define and document stakeholders' requirements.
- 3. Define the <u>scope of the project</u> with a detailed description of the project and finished project deliverables.
- 4. Create a work breakdown sequence.
 - Subdivide the project work and deliverables into small, manageable tasks.
 - b. Update the project document to reflect the work breakdown structure.
- 5. Define the activities that must be performed in order to produce the project deliverables.
 - a. Present activities in an activity list.
 - b. Generate a milestones list.
- 6. <u>Sequence the activities</u> by determining the relationships between project activities.
 - a. <u>Dependent activities</u> cannot be scheduled for completion before a previous task (or input) has been completed.
 - b. <u>Independent activities</u> can be scheduled for completion when they make sense within the project.
- 7. Estimate the activity resources by listing out the supplies and equipment that will be needed to complete the activities defined above.
- 8. Estimate the duration of the activities.
- 9. Develop the <u>schedule of activities</u> based on the <u>availability of resources</u>, the event sequence, and amount of time to complete.
- 10. Estimate the costs of the activities.
- 11. Develop the budget.
- 12. Define what a quality outcome is or define the standard of quality for the project and list those attributes that will form the benchmark against which the success of the project will be measured.
- 13. Identify and document project roles, responsibilities, skills, and reporting relationships.
- 14. Identify the information needs of the stakeholders and define a communication approach. Create a document showing who needs to be kept informed about the project and how those individuals will receive the information.

- 15. Determine how risk management activities will be conducted.
- 16. <u>Identify risks based on cost, schedule, communications, and environmental factors</u>, and determine and document those that may affect the project.
- 17. <u>Prioritize the risks</u> identified above by assessing the likelihood of their occurrence and effect on the project.
- 18. Numerically analyze the effect of the identified risks on the project objectives.
- 19. <u>Develop options in the event that risks identified above manifest themselves</u> as the project unfolds.
- 20. Acquire the needed equipment and supplies.

C. Executing - Assure quality

Execution activities are the activities that are associated with completing the work that has been specified in the project plan and producing the deliverables. During this phase, initial project results may require updating the project management plan, modifying expected activity durations, and making changes to resource productivity and availability.

- 1. <u>Direct and manage the project</u> by performing the work that has been planned.
- 2. Perform <u>quality assurance</u> to make sure that the project procedure and deliverables conform to the standard of quality that was defined in the planning stage.
- 3. <u>Assemble the project team and distribute project assignments</u>. Make sure everyone stays on task and performs as a team player.
- 4. Manage the project team by providing timely feedback and resolving problems.
- 5. Distribute relevant information to project stakeholders.
- 6. Manage stakeholder expectations by addressing issues as they occur.
- 7. Conduct <u>procurements</u> by obtaining seller responses, selecting a seller, and awarding a contract.

D. Monitoring and Controlling

Monitoring and controlling consists of procedures that are performed to observe project execution so that potential problems can be identified in a timely manner and corrective action can be taken to ensure the completion of the project.

- 1. *Monitor and control* project work by <u>reviewing where the project is against the baseline defined in the plan.</u>
- 2. Evaluate how the actual variables of time, cost, schedule, quality, and risk compare to the same variables defined in the project plan. Actual vs. plan
- 3. Prepare status reports, progress measurements, and forecasts for stakeholders.
- 4. <u>Identify</u> the need for any changes that might be required in order to keep the project on schedule. Changes must be reviewed, approved, and evaluated for their effect on the scope and the project deliverables.
- 5. <u>Verify the scope</u> by formalizing acceptance of the completed project deliverables.
- 6. <u>Control the scope</u> by monitoring status of the project and documenting changes to the scope baseline.
- 7. <u>Control the schedule</u> by updating and documenting the completion of activities on the schedule.

- 8. <u>Control the costs</u> by updating the project budget to reflect the current status of the project.
- 9. Control the procurement process.
- 10. Perform quality control by recording the results of quality-control activities.
- 11. <u>Distribute performance information</u> such as status reports, progress measurements, and forecasts.
- 12. <u>Implement a risk response plan</u>, track identified risks, identify new risks, and evaluate risk process effectiveness throughout the project.
- 13. <u>Manage the *vendor relationships*</u>, monitor contract performance, and adjust as necessary.

E. Closing

The project management process is summarized by the following statement:

An authorized project plan is initiated, executed, monitored, and controlled, and eventually ends when the objectives have been completed.

The closing process group verifies that all defined project phases are complete, closes the project, and closes all procurement relationships.

EXAMPLE

Superior Clothing, Inc. (Superior) has undertaken a research and development project to develop a men's fashion dress shirt that is stain-resistant, fire-retardant, and 100 percent wrinkle-free. The company **initiates** the project by defining objectives in a project charter with the appropriate senior management authorization received before moving to the next phase of the project.

During the **planning** phase, the company develops a project management plan and a \$1,000,000 operating budget for the nine-month project. Included in the plan are the project roles and responsibilities for each of the R&D and production employees who will develop and test these prototype dress shirts.

During the **execution** phase, the R&D department and production department work together to begin a limited production of the specialty men's dress shirts based on the specifications developed during the planning phase. The R&D staff then performs extensive testing and quality assurance checks to ensure that the initial batches conform to the project objectives and quality standards set forth in the planning phase. The head of R&D manages all employees affiliated with the development phase of the specialty men's shirts project.

After the initial batches are produced and analyzed for standard conformance, the R&D department recommends further refinements to the production process. Further batches of these specialty men's shirts are created by the production department, with the head of R&D and the production manager closely monitoring the results of the entire production process. The shirts are then test-marketed to several geographic regions, with the sales and customer quality feedback monitored and controlled by the head of R&D and the production manager.

Superior **closes** the specialty shirt project after meeting all of its objectives within the nine-month time frame established for the project, including the final decision to either produce the specialty men's shirts on a full scale basis or abandon its future production.

II. ROLES OF PROJECT MANAGERS, PROJECT MEMBERS, AND OVERSIGHT OR STEERING GROUPS

A. Project Manager

The *project manager* is responsible for project administration on a day-to-day basis. Responsibilities include the following:

- 1. Achieve all of the project objectives while balancing the project constraints of budget, time, and resources.
- 2. Identify and manage internal and external stakeholder expectations.
- 3. Develop the project plan, implement the plan, monitor and control the plan, and close the project when the project objectives have been met.
- 4. <u>Identify and procure the project team members, resolve</u> project team <u>conflicts</u>, and provide feedback to team members.
- 5. <u>Break the project down into smaller manageable tasks</u>, and assign and delegate responsibilities to various team members.
- 6. Communicate project metrics to stakeholders and team members.

B. **Project Members**

Project members perform the project tasks, and their roles generally include:

- 1. Carrying out the work and producing the deliverables that have been defined by the project manager. Project members may be individuals or organizations.
- 2. Understanding the work that must be completed; planning the assigned activities in more detail if needed; completing the work within the budget, time, and quality expectations; and proactively communicating the status of their work to the project manager.

C. Project Sponsor

A *project sponsor* is an individual or group who is internal or external to the project's organization. The project sponsor is responsible for providing resources and support to the project as well as enabling the success of the project. The role of the project sponsor includes:

- 1. Responsibility for overall project delivery.
- 2. Participation in high-level planning and leading the development of the project charter in the project authorization stage.
- 3. <u>Support the project manager</u> in resolving major issues and problems.
- 4. Chair the steering committee.
- 5. <u>Champion the project to upper management</u> and other lateral executives across an organization.
- 6. Remove or overcome organization obstacles and barriers through diplomacy and negotiation.
- 7. Sign off on approvals required to proceed to the next phase of project work.
- 8. Review the project work with the broader goals of the organization in mind.
- 9. Interface between the organization and the project itself.
- 10. Communicate project needs to the steering committee.

D. Executive Steering Committee

An executive steering committee is to a project what the board of directors is to a company; both groups direct but they do not manage on a daily basis.

- 1. The steering committee is a group of executive level people or external organizations charged with regular oversight of a project and with responsibility for the business issues associated with a project.
- 2. Collectively, the group should represent all significant areas of participation (or departments/business units) in an organization so that they have the authority to make binding decisions on behalf of those areas. Examples might include departmental heads, vice presidents, or directors.
- 3. Responsibilities include the following:
 - Give guidance on overall strategic direction of the project to the project sponsor or project manager.
 - b. Approve project deliverables.
 - c. Help resolve issues and policy decisions.
 - d. Approve scope changes.
 - e. Authorize the project in a project charter.
 - f. Approve budget strategy.
 - g. Monitor risk, quality, and timeliness.
 - h. Mandate, control, empower, and make key decisions.

EXAMPLE

ABC Company has authorized a new project to turn its scrap metal into industrial storage part containers. In order to successfully carry out this project, various parties will perform critical roles.

During the initiating phase, the *project sponsor* will be instrumental in developing the project charter. As the project progresses to the planning and execution phases, the project sponsor will be involved with allocating funding and resources to the project. The project sponsor will also serve as the chairperson for the steering committee and communicate any project needs to the steering committee on an ongoing basis.

The *executive steering* committee will provide periodic oversight to the project. The committee's primary function will also include providing general strategic guidance to the project sponsor and project manager.

The *project manager* will be actively involved in the planning, executing, and closing phases of the project. The project manager will develop and implement the project plan, communicate plan requirements to team members, and deal with all administrative issues pertaining to the project on a daily basis.

The *project members* will perform the work assigned by the project manager, which will include manufacturing the storage part containers within the stipulated time frame.

III. PROJECT RISKS, RESOURCE MANAGEMENT, SCOPE, TIME MANAGEMENT, COST MANAGEMENT, AND QUALITY MANAGEMENT

A. Project Risk—General

- 1. Project risk represents an uncertain condition or event that could have a negative (or positive) effect on one or several project objectives. A defined risk may have one or more possible causes and, in the event it occurs, could have one or more effects on the project.
- A distinction exists between individual project risks and overall project risk. Specifically, overall project risk is greater than the sum of individual project risks because it includes all sources of project uncertainty and the effect that the various project outcomes have on the stakeholders.
- 3. Risk is inherent in every aspect of the project management process. To manage risk, the project manager must consider the things that could go wrong in the initiating, planning, execution, monitoring and control, and closing processes.

4. Planning for Risk Management

a. Risk Assessment

- (1) Anticipate everything that could go wrong throughout the project plans.
- (2) Analyze each risk to specify how those uncertainties can affect the performance of the project in time, cost, or meeting user expectations.
- (3) Prioritize risks and determine which risks must be eliminated completely (severe risk), which should receive regular management attention (significant risk), and which risks are immaterial to the project.
- (4) Examples of common project risks include time and cost estimates that are too optimistic, unclear roles and responsibilities, stakeholder input not sought, needs not properly understood, etc.

b. Risk Control

- (1) Spend money in advance to mitigate or prevent the most severe risks identified above.
- (2) Plan for emergencies by having a written emergency plan in place before significant risks arise.
- (3) Track the effects of identified risk in a *risk register* by adding each risk to the log, writing down what will be done in the event it occurs, and writing down what should be done to prevent it from occurring.

5. Inputs Used for Planning for Risk

- a. Risk management plan
- b. Cost management plan
- c. Schedule management plan
- d. Risk register
- e. Enterprise environmental factors
- f. <u>Organizational process assets</u>—Institutional lessons learned from previous projects, project files, and organizational and project process controls.

B. Human Resources (Communication) Management

The project manager must put together staff to work on the project, assign each team member responsibility for tasks, acquire the staff both internally and externally as necessary, and develop the team members by providing feedback and guidance so the team collaborates effectively. The human resource plan formally documents these planning assumptions in writing.

1. Influences on the Human Resource Plan

- a. Organizational culture
- b. Existing staff levels throughout the organization
- c. Condition of the market place
- d. Established communication channels in the organization
- e. Industry regulations/current laws
- f. Sources of additional staff

2. Tools to Enhance Communication and Success in the Human Resource Plan

- a. <u>Hierarchical charts</u> (e.g., typical organizational chart enhanced with work breakdown structures).
- b. A matrix (e.g., a responsibility assignment matrix, or RAM, shows all activities associated with one person and all people associated with one activity).
- c. <u>A text-oriented narrative description</u> outlining responsibility, authority, competencies, and qualifications.
- d. A staffing management plan to explain how and when the project manager will acquire all project participants.
- e. <u>Training and team-building</u> activities.
- f. Recognition and rewards.

3. Conflict Resolution Strategies

- a. Retreat from the conflict.
- b. Focus on areas of agreement and ignore/de-emphasize areas of disagreement
- c. Compromise so that all parties have some of their wants and needs met.
- d. Offer a direct <u>win-lose solution by leveraging authority</u>, usually to remedy a critical conflict.
- e. <u>Build consensus</u> through incorporating various perspectives.
- f. Actively engage the team to solve the problem through discussion.

4. Plan for Things to Go Wrong and Identify an Appropriate Response

- a. Time originally allocated for the completion of a task might vary significantly from the actual time.
- b. Additional staff may be required, leading to cost overruns.
- c. The duration of an activity may need to be modified based on the competency levels of the team members assigned to complete the task.
- d. The project manager might be managing a virtual team that has members in various time zones.

C. Scope

The challenge in managing *scope* is to include all the work required to complete a project and nothing else. There are an infinite number of wants and needs and a finite amount of resources available to successfully produce the project deliverables.

1. Scope Management

- a. Product scope must define the attributes of the product, service, or result.
- b. Project scope defines the work that must take place to produce the product, service, or result defined in the product scope. It also can describe work that is specifically excluded from the project.
- A scope baseline is the formal written approved statement of the project scope and work breakdown structure (WBS), outlining both the end product (product scope) and the project scope.

2. Project Scope Management Process

- a. Create a scope management plan.
- b. Collect and document the project requirements.
- c. Define the scope.
- d. Create a work breakdown structure.
- e. Validate the scope.
- f. Monitor and control scope (changes).

3. Tools and Techniques to Help Define the Scope

- a. Focus groups
- b. Facilitated workshops
- c. Questionnaires and surveys
- d. Creation of prototypes
- e. Interviews
- f. Brainstorming
- g. Observations

4. Relevant Documents

- a. Requirements Documentation—A written document describing the project requirements from all stakeholders. It can include quality requirements, acceptance criteria, and training requirements.
- b. Requirements Management Plan—Documents how requirements will be analyzed, documented, and managed, tracked, and reported. It also describes how changes will be approved and processed.

D. Time Management

Proper time management plays a critical role in completing a project within the time constraints outlined in the project budget and to potentially avoid cost overruns. Time management involves the following processes:

- 1. Develop the schedule management plan.
- 2. Define the project activities.
- 3. Sequence the project activities.
- 4. Estimate the required activity resources.
- 5. Estimate the activity durations.
- 6. Develop a schedule.
- 7. Control the schedule.

E. Cost Management

1. Relevant Cost Terminology

a. Cost Baseline

This represents the cumulative amount of money that is expected to be spent on a project. When graphed, the cost baseline generally represents an S curve because little money is spent at the beginning and the end of a project. The maximum expenditure of money generally occurs during the middle of the project.

b. Project Funding Requirements

Project funding requirements specify the total funding requirements and periodic funding requirements based on the cost baseline. Estimating and tracking costs are integral to project management.

2. Project Cost Management Process

Several processes exist that are used by an entity to ensure that a project is completed within the approved budget, including:

- a. Planning for cost management
- b. Estimating the costs necessary for the project
- c. Determining the budget
- d. Controlling project costs

3. Cost Estimation Methods

Methods for estimating costs include:

a. Judgment

Managers consider a combination of historical information and the cost of materials and labor.

b. Parametric Estimating

Parametric estimating is a technique that relies on a statistical relationship between historical cost and other variables, such as square footage. Examples include regression analysis and the learning curve model. The learning curve model assumes that the cost per unit decreases as more work is completed.

c. Analogous Estimating

With analogous estimating, the cost of similar sized projects conducted in the past is used to approximate the cost of the current project. The method is considered less accurate because it is a top-down approach and generally does not address any unique qualities of the project at hand.

d. Work Breakdown Structure Estimation

Work breakdown structure (WBS) estimation is considered a bottom-up analysis because each WBS activity is estimated and then the costs of each WBS activity are aggregated to form the project budget.

e. Three-Point Estimates

Three-point estimates refer to a range of cost estimates based on a <u>most-likely</u> assumption (realistic) of project costs.

- (1) <u>Optimistic</u> Assumption—Reflects the best-case scenario of project management.
- (2) Pessimistic Assumption—Assumes the worst-case scenario will occur.

f. Reserve Analysis

Reserve analysis is monetary padding to allow for uncertain cost estimations.

g. Project Management Software

Project management software programs generally include a feature that can be used to estimate project costs.

h. Vendor Bid Analysis

Vendor bid analysis assumes the vendor will bid on the work and a contract will be awarded.

i. Earned Value Management

Earned value management combines project scope, cost, and schedule measures to help the project management team measure progress and performance on the project considering the following elements:

- (1) Planned Value (PV)—The amount of money the project should be worth at a particular point in the schedule.
- (2) Earned Value (EV)—The physical work that has been completed to date on the project and the authorized budget for that task.
- (3) Actual Cost (AC)—The actual cost of the project to date.
- (4) Estimate at Completion (EAC)—The estimated total cost of the project at completion.
- (5) Cost Performance Index (CPI) = EV/AC. If the CPI is less than 1, the project is over budget.

F. Quality Management

Project quality management represents the activities and processes performed by an entity on an ongoing basis to ensure that the quality objectives, policies, and procedures pertaining to a project will meet the needs or requirements for which the project was designed. Project quality management contains three processes including plan quality management, quality assurance, and control quality.

1. Plan Quality Management

- a. Identify quality requirements/standards for the project and deliverables.
- b. Document how the project will comply with specific quality requirements.

2. Perform Quality Assurance

- a. Audit the quality requirements and results from quality control measurements.
- b. Ensure that proper quality standards are used.

3. Control Quality

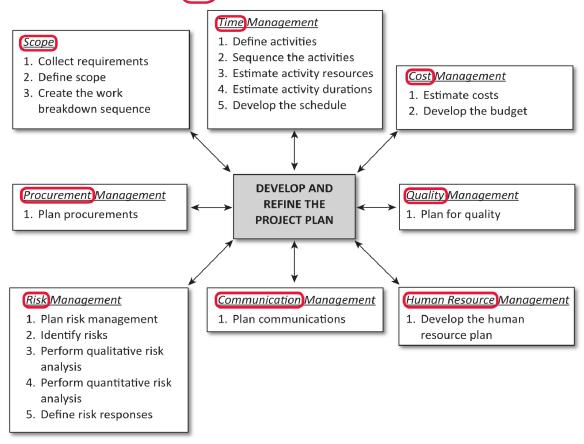
- a. Monitor and record results of the execution of quality control activities to determine causes of poor product quality or processes.
- b. Recommend process changes as necessary.
- c. Validate that project deliverables meet specified requirements.

4. Quality Tools

Seven quality (control) tools are used to solve quality related problems. Also known in the industry as the "7QC Tools," they are:

- a. Flowcharts
- b. Check sheets
- c. Cause-and-effect diagrams
- d. Histograms
- e. Pareto diagrams
- f. Scatter diagrams
- g. Control charts

G. Graphical Flow ** HW



GLOBALIZATION AND LOCAL ECONOMIES

I. THE IMPACT OF GLOBALIZATION ON COMPANIES

Globalization is defined as the distribution of industrial and service activities across an increasing number of nations. Globalization produces deeper integration of the world's individual national economies and makes them more interdependent. Reduced barriers to trade have created opportunities to conduct operations in multiple countries or conduct import/export operations within the context of a traditional domestic operation. Entities that conduct business outside the country in which they are organized are frequently referred to as *multinational corporations* (MNC).

A. Globalization

Globalization is often measured by world trade as a percentage of GDP—the greater the percentage, the greater degree of globalization.

1. Factors that Drive Globalization

a. Improvements in Transportation

<u>Increased efficiencies in *transportation*</u> enhance the competitive status of importers in domestic markets.

b. Technological Advancements

<u>Knowledge-based products</u> (such as technical support for software, etc.) eliminate the importance of location.

c. Deregulation of International Financial Markets

Elimination of capital controls increases the options for direct foreign investment, although political and legal limitations are still an inherent risk of international commerce.

d. Organizational/Operational Options for International Business

When conducting business internationally, an entity must decide whether to centralize or decentralize certain business operations or functions. The availability of human labor, raw materials or transportation channels for a business region, can affect the type of production, distribution, and marketing activities performed by a region.

2. Globalization Promotes Specialization

Economies of scale are larger in a global economy. Multinational companies often utilize economies of scale in their global production, distribution, and marketing networks.

Specialization that leverages comparative advantage is a natural outcome.

3. Globalization Imparts Responsibilities of World Citizenship

Corporations have an implied duty to:

- a. Act responsibly regarding environmental issues.
- b. <u>Promote political stability</u> and cooperation among nations.

B. Motivations for International Business Operations

Entities are encouraged to look beyond the political borders in which they were organized to maximize shareholder value. Several economic theories support international trade as a means of achieving improved shareholder value.

1. Comparative Advantage

Specialization in the production and trade of specific products produces a *comparative* advantage in relation to *trading* partners. Companies and countries use comparative advantage to maximize the value of their efforts and resources.

EXAMPLE

The island nation of Bermuda produces no gasoline or vehicles, yet its roadways are filled with vehicles of all types. The country specializes in tourism and uses the money it earns from its visitors to buy (import) vehicles and petroleum products. The country maximizes it resources by specializing in tourism and buying transportation resources elsewhere.

2. Imperfect Markets

Resource markets are often deemed to be *imperfect*. The ability to trade freely between markets is often limited by the physical immobility of the resource or regulatory barriers. In order to retrieve more resources, companies must trade outside their borders.

EXAMPLE

Hi-Tech Components, Inc. requires special electronic components to build its state-of-the art antenna systems. Although the company purchases 50 percent of these components domestically, Hi-Tech has historically purchased 35 percent and 15 percent of the remaining specialized components from Asia and Europe, respectively.

Over the past six months, Hi-Tech has faced a significant increase in prices for these international components due to production shortages, higher shipping costs, and political tensions with several of the exporting countries. In order to remedy this risk, Hi-Tech is currently seeking other international trading partners for these specialized components.

3. **Product Cycle**

Product manufacture or delivery is subject to a definable cycle, starting with the initial development of the product to meet needs in the domestic markets. Product cycle theory predicts that domestic success will result in domestic competition, encouraging the export of products or services to meet foreign demand and to maintain efficient use of capacity. Foreign success will in turn promote foreign competition. The entity is then motivated to establish a business outside its boundaries to differentiate itself more effectively and to compete with foreign business rivals.

C. Methods of Conducting International Business Operations

Multinational operations are structured in any number of ways. The following terms help define different methods of organization.

1. International Trade

Companies (and nations) conduct international trade by <u>exporting/importing products</u> <u>or services</u>.

2. Licensing

Entities that provide the <u>right to use processes or technologies in exchange for a fee</u> are engaged in licensing activities.

EXAMPLE

Wireless, Inc., a U.S. corporation, obligates itself to establishing and maintaining cellular telephone systems in Mexico in exchange for a licensing fee to use its technology.

3. Franchising

Franchisors are entities whose marketing service or delivery strategy <u>provides training</u> and related service delivery resources in exchange for a fee.

EXAMPLE

Flip-a-Burger, Inc., a U.S. corporation, obligates itself to providing training and the use of unique company logos to businesses that operate in Peru.

4. **Joint Ventures**

Joint ventures take advantage of comparative advantage of one or both of the participants in marketing or delivering a product.

XAMPLE

Engulf & Devour Food Products, a U.S. corporation, teams with Chez Brule, a French concern, to distribute U.S. confections throughout France using Chez Brule's distribution network.

5. Direct Foreign Investment (DFI)

An entity may establish international operations by <u>purchasing a foreign company as a subsidiary or by starting a subsidiary operation within the borders of a foreign country.</u>

6. Global Sourcing

Global sourcing is the synchronization of all levels of product manufacturing, including research and development, production, and marketing, on an international basis. Global sourcing is frequently implemented through a range of organizational and business arrangements (e.g., import/export operations, licensing, franchises, joint ventures).

D. Relevant Factors of Globalization

Factors relevant to assessing the effect of globalization on a company, including its financial reporting, are described below.

1. Political and Legal Influences

Conducting business internationally may involve certain political risks that could be potentially disruptive to an entity. The legal requirements for conducting business in a given foreign country should also be assessed.

2. Potential for Asset Expropriation

Nations may *expropriate* (take) assets from the international companies that own the assets. Assessing the risk of political intervention is integral to business planning and financial reporting.

3. Taxes and Tariffs

Governments may attempt to control economic activity through *taxes and tariffs*. Mitigation of this risk is typically handled through transfer pricing.

4. Limitations on Asset Ownership or Joint Venture Participation

Governments may limit the amount of ownership or entirely restrict any ownership of business ventures within their borders, thereby limiting joint ventures and direct investments.

5. Content or Value Added Limits NAFTA

Sometimes referred to as sourcing requirements, governments may provide tariff reductions to companies whose imports include specified percentages of material and labor in their products.

6. Foreign Trade Zones

Governments may establish trade zones in which tariffs are waived until the goods leave the zone. The creation of foreign trade zones affects the government's control of imports and the location of import facilities.

7. Economic Systems

a. Centrally Planned Economies

Some economies (such as China) are centrally planned. Factors of production (capital, land, etc.) are owned by the government and subject to restriction.

b. Market Economies

Most industrialized economies (such as the United States and Japan) are market economies. The factors of production are owned by individuals.

c. Conglomerates

Establishment of integrated conglomerates (e.g., the Japanese keiretsu or the Korean chaebol) creates self-sustaining entities that could not exist in the United States (fully integrated financing, manufacturing, and supplying organizations would likely violate antitrust laws).

8. Culture

Different *cultures* affect international business. *Culture* can be defined as the shared values and attitudes of a group. The cultures of nations or regions typically involve the following issues.

a. Individualism vs. Collectivism

As the name implies, some cultures (such as that of the United States) place a high value on individualism, while others (often Asian) are more likely to place a higher value on the collective.

b. **Uncertainty Avoidance**

Certain cultures have a difficult time dealing with *uncertainty*. The United States typically has a guarded ability to accept uncertainty, while Asian and South American cultures may be highly averse to dealing with uncertainty.

c. Short-Term vs. Long-Term Orientation

Certain cultures are traditional, adapting more slowly to change, while others are more focused on immediate gratification. The United States tends to have a short-term orientation and many Asian cultures have a longer-term focus.

d. Acceptance of Leadership Hierarchy

Cultures have varying degrees of acceptance of vast differences between leadership and the rank and file. Some accept large differences in power and others anticipate greater levels of equality. The United States has a balanced view on this issue, although former European monarchies may be more accepting of wide differences in power. Less-developed former colonial counterparts in Asia and South America are often more distrustful of wide dispersions of power.

e. Technology and Infrastructure

International business may require factoring in wide differences in:

- (1) Communications systems
- (2) Transportation systems
- (3) Power and water sources
- (4) Training of staff
- (5) Differences in accounting practices

E. Inherent Risks of International Business Operations

The risks associated with conducting international business operations are generally categorized by the following:

1. Exchange Rate Fluctuation - See page 44

Exchange rate or currency risks (and mitigation techniques) are discussed in more depth in the next section, Financial Risk Management. They are generally divided into three categories:

- a. Transaction risk
- b. Economic risk
- c. Translation risk

2. Foreign Economies

An operation within a *foreign economy* carries the risk of functioning within the general health or weakness of a particular economy. Domestic economies may be booming while international economies may be suffering and acting as a drag on the company's overall performance. The state of the foreign economy in which the multinational company operates is highly significant to risk evaluation.

a. Foreign Demand < | Income of customer | Purchasing power of currency

A multinational corporation exporting to a foreign country is vitally concerned with demand within that country. Demand is directly affected by the health of the economy of the country in which it operates.

- (1) Weakening demand may cause the foreign government to implement tariffs or other regulatory measures that reduce foreign penetration.
- (2) Measures to reduce foreign penetration may require either curtailment of foreign operations or export of goods produced by the multinational inside the foreign country instead of selling within the foreign country.

b. Interest Rates

- (1) Higher interest rates in the foreign country are indicators of slower economic growth and reduced demand.
- (2) Lower interest rates in the foreign country may be indicative of increased growth and demand.

c. Inflation

- (1) Higher local (economy) inflation reduces purchasing power, making imported goods more expensive and reducing local demand.
- (2) Lower local (economy) inflation increases the purchasing power for imported goods, resulting in higher local demand.

d. Exchange Rates

- (1) Weak local currency reduces demand for imported goods.
- (2) Strong local currency increases demand for imported goods.

3. Political Risk

Political risks represent noneconomic events or environmental conditions that are potentially disruptive to financial operations. Ultimately, political climates or actions can disrupt cash flows. Although expropriation of productive resources represents the most extreme political risk, other features of political risk also must be considered, including:

- a. Bureaucracies and related inefficiencies or barriers to trade
- b. Corruption
- c. The host government's attitude toward foreign firms
- d. The attitude of consumers toward foreign firms
- e. Inconvertibility of foreign currency
- f. War

F. Complications of Global Sourcing

1. Global Sourcing Anticipates Multiple Sources for Materials

a. Raw materials (e.g., petroleum products) may be produced in the Middle East.



- p. Refining petroleum products into ethylene (plastic) may take place in Asia.
- c. Molding and assembling of plastic may take place in China.
- d. Transportation and distribution may take place in the United States.

2. Global Sourcing Anticipates Multiple Exchange Rates

Multiple exchange rates and tariffs may exist as raw materials find their way into the final product.

II.

G. International Accounting Practices

The International Accounting Standards Board (IASB) seeks to make standards equivalent or compatible through the issuance and use of International Financial Reporting Standards (IFRS) as a means of mitigating the risk of inconsistent financial reporting.

- Management must be aware of the local reporting requirements and act accordingly.
 Some countries have replaced their local standards with those of IFRS, but others have not. Some have hybrid reporting requirements.
- 2. Discrepancies in reporting standards can lead to inconsistencies in accounting terminology and reporting practices that obfuscate financial reporting and detract from U.S. GAAP's goal of financial reporting transparency.

SHIFTS IN ECONOMIC BALANCE OF POWER U.S. dominant U.S. - EU - BRIC

The dominance of the United States as the world's lone superpower is referred to as a unipolar distribution of power. The expansion of the rest of the world's economies, including those of the European Union (EU) and the emerging nations, led by Brazil, Russia, India, and China (BRIC), is expected to gradually shift power, thereby ushering in an era of multipolarity, wherein power is distributed among many nations. Although the absolute strength of the United States is not likely to decrease, its relative power is likely to decline as the strength of other nations grows.

A. Defining National Power

National power has multiple dimensions, including the following:

1. Geography

Land mass and strategic locations on the globe are significant to power. The United States and China, for example, are located in temperate zones and have significant land. Other nations may be smaller or located in areas where weather is more severe.

2. Population

Population translates to workforce. The larger and more skilled a nation's workforce, the more power it exhibits.

3. Resources

Nations rich in natural resources have the potential to be more powerful.

4. Economy

The size of a nation's *economy* as a percentage of worldwide GDP is a strong measure of power. The development of an economy, and its integration with other economies of the world, is also considered a measure of power. Typically, the larger, better developed and integrated economies are more powerful.

5. Military

The size and effectiveness of a nation's military equates to power.

6. Diplomacy

The influence of diplomats around the world affects the perception of strength or weakness and, by extension, the power of the nation.

7. Identity

A nation's sense of identity and its acceptance of global responsibilities contribute to its perceived power.

B. Multipolarity and Interdependence

1. Functional Interdependence

Functional interdependence is the participation of nations in worldwide institutions, such as the United Nations (U.N.), the World Trade Organization (WTO), and the International Monetary Fund (IMF).

2. Systemic Interdependence

Systemic interdependence acknowledges that all members of the global community share the planet Earth. Actions of governments that adversely affect the climate or reduce our safety (such as nuclear proliferation) affect all nations.

3. Multipolarity

The increase in *multipolarity* will require an acknowledgement of the interdependence of nations and cooperation among nations consistent with shifts in the balance of power.

EXAMPLE

The ability of the world's emerging nations to compete with the economics of the industrialized world for power, resources, influence, etc., is a change or shift in the economic balance of power from previous decades. Balance of power theory holds that states that are members of the global economy can either engage in balancing or bandwagoning behavior. An emerging nation might side with the United States or other industrialized nations in an embargo or other economic sanction (bandwagoning) or could join with other emerging nations in ignoring the leadership of the United States (balancing). The significance of such a decision to change the effect of an embargo would represent an important shift in the balance of economic power.

C. Dynamics of the Balance of Power

1. Developed vs. Emerging Nations

- a. Developed nations are generally regarded as the world's largest industrial economies.
- b. *Emerging nations* are generally regarded as the countries not included on the list of developed nations and are lead by Brazil, Russia, India, and China (BRIC).

2. Trade Deficits

- a. Developed nations have generally produced *trade deficits* as their domestic consumption results in more imports than exports.
- b. Emerging nations often produce *trade surpluses* as their exports feed the consumption of developed nations.

3. Balance of Power

Emerging nations, notably China, have maintained an artificially low valuation of their currencies relative to those of developed nations (particularly the U.S. dollar), keeping their goods cheap. Consequently, an emerging, less wealthy country effectively finances a richer country.

FINANCIAL RISK MANAGEMENT

- Uncertainty

ANALYZING THE TRADE-OFFS BETWEEN RISK AND RETURN I.

Risk may be defined as the chance of financial loss. More formally, the term "risk" may be used interchangeably with the term "uncertainty" to refer to the variability of returns associated with a given asset. Return may be defined as the total gain or loss experienced on behalf of the owner of an asset over a given period. Typically, greater risk yields greater returns. The seller of financial securities compensates the buyer of financial securities with increased opportunity for profit by offering a higher rate of return. Risk and return are a function of both market conditions and the risk preferences of the parties involved.

Risk Preferences A.

Different managers have varying attitudes toward risk. Three basic risk preference behaviors exist.

Risk-Indifferent Behavior - Highest return period

Risk-indifferent behavior reflects an attitude toward risk in which an increase in the level of risk does not result in an increase in management's required rate of return.

2. Risk-Averse Behavior (GR)



Exceptions

Risk-averse behavior reflects an attitude toward risk in which an increase in the level of risk results in an increase in management's required rate of return. Risk-averse managers require higher expected returns to compensate for greater risk. Most managers are risk-averse.

3. Risk-Seeking Behavior

Risk-seeking behavior reflects an attitude toward risk in which an increase in the level of risk results in a decrease in management's required rate of return. Risk-seeking managers are willing to settle for lower expected returns as the level of risk increases.

B. **Diversification**

Risk is often reduced by diversification, which is the process of selecting investments of different (or offsetting) risks. Not all risk can be managed through diversification. Total risk is the combination of the diversifiable and the nondiversifiable risk of a single asset.

Diversifiable Risk - Unique to a specific business

Diversifiable risk (which is also referred to as nonmarket, unsystematic, or firm-specific risk) represents the portion of a single asset's risk that is associated with random causes and can be eliminated through diversification. Diversifiable risk is attributable to firmspecific events (e.g., strikes, lawsuits, regulatory actions, or the loss of a key account).

Nondiversifiable Risk - Impacts everyone 2.

Nondiversifiable risk (which is also referred to as market or systematic risk) is attributable to market factors that affect all firms and cannot be eliminated through diversification. Nondiversifiable risk is attributable to factors such as war, inflation, international incidents, and political events.

3. Managing Different Types of Risk

The only relevant risk is nondiversifiable risk, because (in theory) any investor can create a portfolio of assets that eliminates all (or virtually all) diversifiable risk. The investor therefore should only be concerned with nondiversifiable risk.

PASS KEY

It is important to be able to classify risk into two broad categories:

D Diversifiable Risk

U Unsystematic Risk (Nonmarket/Firm Specific)

N Nondiversifiable Risk

S Systematic Risk (Market)

Remember the mnemonic DUNS to keep these risk types and their alternative names clear.

C. Various Types of Risk

Measurements of risk attempt to capture the multiple dimensions of risk. Risk exposures include interest rate, market, default, credit, and liquidity risk.

1. Interest Rate Risk (or yield risk)

Interest rate risk (or yield risk) is often used in the context of financial instruments and represents the exposure of the owner of the instrument to fluctuations in the value of the instrument in response to changes in interest rates.



EXAMPLE

Thayer Thermodynamics, Inc. owns a five-year, \$10,000 Duffy International coupon bond purchased at a discount. Recently, the market rate of interest increased 1 percent, causing the market value of the bond to decline to \$9,610. Assuming the bond's carrying value on the financial statements was \$9,840 at the time the market rate of interest abruptly increased, Thayer Thermodynamics suffered a \$230 market loss in bond value as a result of its exposure to interest rate risk.

2. Market Risk

The exposure of a security or firm to fluctuations in value as a result of operating within an economy is referred to as *market risk*. Market risk is sometimes referred to as *nondiversifiable risk* because it is a risk inherent in operating within the economy.



EXAMPLE

The prices on publicly traded stocks generally increase and decrease together with overall market activity. Although the prices may not increase or decrease identically, they often move in the same direction. Microsoft Corp. stock, for example, might increase in value on a given day from \$37.00 per share to \$37.75 per share. This increase in the price of Microsoft's stock is consistent with the overall 2 percent increase in the NASDAQ on that trading day.

3. Credit Risk

Credit risk affects borrowers. Exposure to credit risk includes a company's inability to secure financing or secure favorable credit terms as a result of poor credit ratings. As credit ratings decline, the interest rate demanded by lenders increases, collateral may be required, and other terms are generally less favorable to the borrower.

EXAMPLE





Duffy International seeks to borrow \$10,000 for five years, but the company has a history of late payments and displays a high debt-to-income ratio and high debt-to-equity ratio (measurements discussed later). Although market rates of interest are 7 percent, lenders may only loan money to Duffy International at an 8 percent rate, require a lien on the company's inventory as collateral, and insist on shortening the term of the loan to three years. Duffy International's inability to borrow the funds it needs at the market rate of interest and under favorable terms illustrates the company's exposure to credit risk and demonstrates the creditors' attempt to mitigate default risk (see below).

4. Default Risk

Default risk affects lenders. Creditors are exposed to default risk to the extent that it is possible that its debtors may not repay the principal or interest due on their indebtedness on a timely basis.

EXAMPLE

Thayer Thermodynamics, Inc. (TTI) holds \$100,000 worth of \$1,000 face value bonds recently issued by Duffy International. During the third quarter of the year, Duffy fails to make its quarterly interest payment on its outstanding bond issue. The loss incurred by TTI results from the company's exposure to default risk or the possibility that the debtor will not make its debt service payments as outlined in the bond agreement (indenture).

5. Liquidity Risk

Liquidity risk <u>affects lenders</u> (investors). Lenders or investors are exposed to liquidity risk when they desire to sell their security, but cannot do so in a timely manner or when material price concessions have to be made to do so.

EXAMPLE

Smithfield Company holds several fixed income securities of Johnson Manufacturing Company. Due to its current operational needs, Smithfield attempts to sell \$250,000 of Johnson's 10-year bonds but is unsuccessful in attracting willing buyers at current market prices. As the company's working capital requirements increase, Smithfield significantly discounts the bonds to obtain the proceeds from the Johnson bond investments. Smithfield is exposed to liquidity risk, as evidenced by its inability to sell the bonds on a timely basis and the need to make concessions to attract willing investors.

D. Computation of Return = Yield

Return compensates investors and creditors for assumed risk. Return is often stated or measured by interest rates. Interest can be expressed as either a cost (interest expense) to debtors or income (interest income) to investors.

1. Stated Interest Rate

a. Definition

The *stated interest rate* (sometimes referred to as nominal interest rate) represents the <u>rate of interest charged before any adjustment for compounding or market factors</u>.

b. Computation

The *stated interest rate* is the rate <u>shown in the agreement of indebtedness</u> (e.g., a bond indenture, promissory note, etc.).

EXAMPLE

A \$10,000 promissory note states that payments will be made quarterly at a 10 percent interest rate per annum.

What is the stated rate?

Hint: You do not need a calculator.

Stated rate = 10%

2. Effective Interest Rate

a. Definition

The effective interest rate represents the actual finance charge associated with a borrowing after reducing loan proceeds for charges and fees related to a loan origination.

b. Computation

Effective interest rates are computed by <u>dividing the amount of interest paid based</u> on the loan agreement by the net proceeds received.

EXAMPLE

A \$10,000 promissory note has a stated rate of 10 percent per annum and is due in one year. The bank charges a loan origination fee of \$75 and the state in which the loan is made levies a \$50 documentary stamp charge. Taxes and fees are taken from loan proceeds. The effective interest rate is computed as follows:

Annual Percentage Rate = Effective periodic rate

Definition

of compounding periods

The annual percentage rate of interest represents a noncompounded version of the effective annual percentage rate described and computed below. The annual percentage rate is the rate required for disclosure by federal regulations.

b. Computation

Annual percentage rates are computed as the effective periodic interest rate times the number of periods in a year. Annual percentage rate emphasizes the amount paid relative to funds available.

EXAMPLE

A \$10,000 promissory note displays a stated rate of 8 percent with interest to be paid semiannually. The bank charges a \$75 loan origination fee and a documentary tax of \$50 is assessed by the state. What is the annual percentage rate?

Compute the effective periodic interest rate (as per above) Step 1

> Interest paid (10,000 x 8% x 6/12) \$ 400 Divided by available funds (10,000 - 75 - 50)÷ 9,875 4.05% Effective periodic interest rate

Step 2 Multiply the effective periodic interest rate by the number of periods in a year

> Effective periodic interest rate 4.05% Periods in a year ___2 Annual percentage rate 8.10%

Effective Annual Percentage Rate (| + Stated vate) # of comp. - |

APR

Definition a.

The effective annual percentage rate represents the stated interest rate adjusted for the number of compounding periods per year. The effective annual percentage rate is abbreviated APR.

b. Computation

Computation of the effective annual percentage rate (APR) is computed as follows:

Effective annual interest rate = [1 + (i / p)]p - 1

i = Stated interest rate

p = Compounding periods per year

EXAMPLE

A note with an 8 percent stated rate of interest compounded semiannually (two times per year) has the following effective annual percentage rate or APR:

Effective annual interest rate = [1 + (i / p)]p - 1

Effective annual interest rate = [1 + (0.08 / 2)]2 - 1 $(1 + .04)^2 - 1$

Effective annual interest rate = [1 + (0.04)]2 - 1

Effective annual interest rate = 1.0816 - 1

Effective annual interest rate = 8.16%

5. Simple Interest (amount)

a. Definition

Simple interest is the amount represented by <u>interest paid only</u> on the original amount of principal without regard to compounding.

b. Computation

Simple interest is formulated as follows:

 $SI = P_0(i)(n)$

SI = Simple interest

 P_0 = Original principal

i = Interest rate per time period

n = Number of time periods

Principal × Int. rate

x # periods

EXAMPLE

A \$10,000 promissory note bears simple interest at 8 percent for two years. What is the simple interest on this obligation?

 $SI = P_o(i)(n)$

SI = \$10,000 (8%)(2)

SI = \$1,600

6. Compound Interest (amount)

a. Definition

Compound interest is the amount represented by interest earnings or expense that is based on the original principal plus any unpaid interest earnings or expense. Interest earnings or expense, therefore, compound and yield an amount higher than simple interest.

b. Computation

Compound interest is computed as a future value as follows:

 $FV_n = P_0(1+i)^n$

P_o = Original principal

i = Interest rate

n = Number of periods

EXAMPLE

A promissory note for \$10,000 carries an interest rate of 8 percent for two years, compounded annually. What is the maturity value of the promissory note?

 $FV_n = P_o(1+i)^n$

 $FV_n = $10,000 (1 + 0.08)^2$

FV_n = \$10,000 (1.1664)

FV_n = \$11,664

\$10,000

× 1.08

\$11,664

7. Required Rate of Return

The required rate of return is calculated adding the following risk premiums to the risk-free rate:

a. Maturity Risk Premium (MRP)

Maturity risk premium (MRP) is the <u>compensation that investors demand for</u> <u>exposure to interest rate risk over time</u>. This risk increases with the term to maturity.

b. Purchasing Power Risk or Inflation Premium (IP)

Purchasing power risk or inflation premium (IP) is the <u>compensation investors</u> require to bear the risk that price levels will change and affect asset values or the purchasing power of invested dollars (e.g., real estate).

c. Liquidity Risk Premium (LP)

Liquidity risk premium (LP) is the <u>additional compensation demanded by lenders</u> (investors) for the risk that an investment security (e.g., junk bonds) <u>cannot be sold</u> on a short notice without making significant price concessions. Liquidity is defined as the ability to quickly convert an asset to cash at fair market value.

d. Default Risk Premium (DRP)

Default risk premium (DRP) is the <u>additional compensation demanded by lenders</u> (investors) for bearing the risk that the issuer of the security will fail to pay interest and/or principal due on a timely basis.

EXAMPLE

A bank desires to purchase a corporate bond for its investment portfolio. Given the characteristics of the bond issue/issuer and current financial market conditions, a required rate of return of 8 percent is deemed appropriate for the bond issue, as follows:

percent is deemed appropriate for the bond issue, as follows:		
	Real rate of return	3%
	+ Inflation premium (IP)	<u>2</u> %
	= Nominal rate of return	5% - Nominal RF rate
	+ Risk premium:	
	Interest rate risk (MRP)	
	Liquidity risk (LP)	
	Default risk (DRP)	<u>3</u> %
	= Required rate of return	<u>8</u> %

II. FINANCIAL DECISIONS USING PROBABILITY AND EXPECTED VALUE MODELS

Probability is the chance that an event will occur. Probabilities are assigned values between zero (0) and one (1). A zero (0) probability indicates that there is no chance the event will ever occur (i.e., an impossibility). A probability of one (1) indicates that the event will always occur (i.e., a certainty).

A. Types of Probability

1. Objective Probability

- Objective probability is <u>based on past outcomes</u>.
- b. The objective probability of an event is equal to the <u>number of times that an event</u> will occur divided by the total number of possible outcomes.

EXAMPLE

The chance of selecting the letter "a" from the 26 letters in the alphabet is 1 in 26, or 1/26.

2. Subjective Probability

- a. Subjective probability is <u>based on an individual's belief</u> about the likelihood that a given event will occur.
- b. It is estimated <u>based on judgment and past experience</u> of the likelihood of a future event(s). Stating that your favorite team has a 60 percent chance of winning the next game is a subjective probability.

B. **Expected Value**

Expected value is the <u>weighted-average of the probable outcomes</u> of a variable where the weights are the probability of an outcome occurring.

1. Calculation of Expected Value

Expected value is found by multiplying the probability of each outcome by its payoff and summing the results.

EXAMPLE 1-EXPECTED VALUE

The expected value of profits (E[X]) can be found by multiplying the different possible profit levels by the associated probabilities and summing the results (e.g., a 5 percent chance of earning \$0 profit, a 10 percent chance of earning \$100 profit, etc.).

$$E[X] = (\$0 \times 0.05) + (\$100 \times 0.10) + (\$200 \times 0.35) + (\$300 \times 0.20) + (\$400 \times 0.20) + (\$500 \times 0.10)$$
 $E[X] = \$0 + \$10 + \$70 + \$60 + \$80 + \$50 = \$270$

Thus, given the possible profit outcomes and their associated probabilities, expected profits are \$270.

EXAMPLE 2-EXPECTED VALUE

Dough Distributors has decided to increase its daily muffin purchases by 100 boxes. A box of muffins costs \$2 and sells for \$3 through regular stores. Any boxes not sold through regular stores are sold through Dough's thrift store for \$1. Dough assigns the following probabilities to selling additional boxes through regular stores:

What is the expected value of Dough's decision to buy 100 additional boxes of muffins?

The expected value of a decision is computed by multiplying the probability of each outcome by its value or profit. The sum of the product of the probability times each outcome is the expected value.

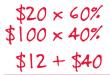
There is a 60 percent probability that Dough will sell 60 of the 100 additional boxes through regular stores and 40 of the 100 through thrift stores. That means that Dough would have a 60 percent chance of making a profit of \$20 (60 boxes at a \$1 profit (\$3 - \$2\$) sold through the regular stores and 40 boxes at a \$1 loss (\$1 - \$2\$) sold through thrift stores).

There is a 40 percent probability that Dough will have a profit of \$100 (100 boxes sold at a \$1 profit through regular stores and zero boxes sold at a loss through thrift stores).

60% probability of a \$20 profit	\$12 [0.60 × \$20]
40% probability of a \$100 profit	<u>40</u> [0.40 × \$100]
Expected value	\$52

2. Expected Value of Perfect Information

The expected value of perfect information is the difference between the expected payoff under *certainty* and the expected monetary value of the best alternative under *uncertainty*.



\$52

3. Shortcomings of Probability Concepts and Expected Values

- a. Expected value is based on repetitive trials, not on one trial, as is the case with many business decisions.
- Expected value represents the average outcome, not the outcome that is actually observed.

4. Benefits of Probability Concepts and Expected Values

Expected values provide an objective framework for assessing risks and probable outcomes and are useful in decision making.

III. INTERNATIONAL RISKS—EXCHANGE RATE RISK: FACTORS AND EXPOSURE CATEGORIES

Within domestic environments, a single currency defines the value of assets, liabilities, and operating transactions. In international settings, the values of assets, liabilities, and operating transactions are established not only in terms of the single currency, but also in relation to other currencies. Exchange rate (FX) risk exists because the relationship between domestic and foreign currencies may be subject to volatility.

- Risk <u>factors</u> include <u>trade</u> and <u>financial</u> factors.
- Risk <u>exposure categories</u> include <u>transaction economic</u> and <u>translation exposures.</u> Pages <u>Financial managers must understand these risk factors and mitigate the FX risk exposures.</u> 45 47

A. Factors Influencing Exchange Rates

Circumstances that give rise to changes in exchange rates are generally divided between trade-related factors (including differences in inflation, income, and government regulation) and financial factors (including differences in interest rates and restrictions on capital movements between companies).

1. Trade Factor—Relative Inflation Rates

When domestic inflation exceeds foreign inflation, holders of domestic currency are motivated to purchase foreign currency to maintain the purchasing power of their money. The increase in demand for foreign currency forces the value of the foreign currency to rise in relation to the domestic currency, thereby changing the rate of exchange between the domestic and foreign currency.

EXAMPLE

Assume that the <u>U.S. dollar is relatively stable</u> while the <u>Mexican peso is suffering from sudden</u> inflationary pressures. As the Mexican peso buys less in the domestic Mexican economy, Mexicans and their banking institutions seek the safe haven of the <u>U.S. dollar</u> to maintain the purchasing power of their liquid resources. The <u>demand for U.S. dollars</u> created by Mexicans buying them with Mexican pesos makes the <u>U.S. dollar</u> more valuable in terms of the peso and drives up the exchange rate. The <u>U.S. dollar</u> commands more pesos in an exchange of currency.

2. Trade Factor—Relative Income Levels

As income increases in one country relative to another, exchange rates change as a result of increased demand for foreign currencies in the country where income is increasing.

EXAMPLE

The <u>income level in the United States increases significantly</u> in the second quarter. <u>Americans flock to Mexico City on vacation</u> to buy piñatas. The increased <u>supply of American dollars seeking to buy pesos</u> to purchase Mexican goods causes the value of the American dollar to fall in relation to a stated number <u>of pesos</u>. The exchange rate is thus affected by relative income levels and the associated demand for foreign currency created by higher domestic income.

3. Trade Factor—Government Controls Vs. free market

Various trade and exchange barriers that artificially suppress the natural forces of supply and demand affect exchange rates.

EXAMPLE

A tariff on imported piñatas would have the effect of discouraging the purchase of imports, thereby reducing demand for the peso and maintaining the exchange rate.

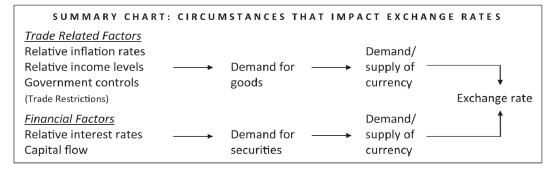
4. Financial Factors—Relative Interest Rates and Capital Flows

Interest rates create demand for currencies by motivating either domestic or foreign investments. The forces of supply and demand create changes in the exchange rate as investors seek fixed returns. The effect of interest rates is directly affected by the volume of capital that is allowed to flow between countries.

EXAMPLE

Assume that <u>returns on institutional investments in Mexico skyrocket</u> in the third quarter while returns on comparable institutional investments remain significantly lower in the United States. <u>U.S. investors find the opportunity to earn high returns with similar risks in Mexican financial institutions irresistible.</u> The <u>demand for pesos increases as American investment increases</u>. The exchange rate changes as the peso commands more United States dollars.





B. Transaction Exposure—Definition and Measurement

Exchange rate risk is defined, in part, by *transaction exposure*. Transaction exposure is defined as the potential that an organization could suffer economic loss or experience economic gain upon settlement of individual transactions as a result of changes in the exchange rates. Transaction exposure is generally measured in relation to currency variability or currency correlation. Measurement of transaction exposure is generally done in two steps:

- 1. Project foreign currency inflows and foreign currency outflows. Net A/R & A/P
- 2. Estimate the variability (risk) associated with the foreign currency.

EXAMPLE

Seattle Import/Export, a U.S. import/export company, imports commodities from Canada that it pays for in Canadian dollars and exports commodities to Canada for which it receives Canadian dollars. If Seattle Import/Export anticipated that it would export C\$10,000,000 to Canada over the next year while importing C\$8,000,000 over the same period, the net exposure in Canadian dollars is a C\$2,000,000 inflow (receivable).

If the <u>current exchange rate is \$0.75/C\$1, the net exposure in United States dollars is \$1,500,000 (C\$2,000,000 x 0.75). If the <u>rate is anticipated to fluctuate five cents</u>, between \$0.70 and \$0.80, the total U.S. dollar fluctuation exposure would be expected to be between \$1,400,000 and \$1,600,000.</u>

-Good

C. **Economic Exposure**—Definition and Measurement

In addition to transaction exposure, exchange rate risk is defined, in part, by economic exposure. Economic exposure is defined as the potential that the present value of an organization's cash flows could increase or decrease as a result of changes in the exchange rates. Economic exposure is generally defined through local currency appreciation or depreciation and is measured in relation to organization earnings and cash flows.

Currency Appreciation and Depreciation

Currency appreciation (depreciation) refers to the strengthening (weakening) of a currency in relation to other currencies. A/R J -Bad A/P V -Good

Effect of Currency Appreciation

As a domestic currency appreciates in value or becomes stronger, it becomes more expensive in terms of a foreign currency. As a currency appreciates, the volume of outflows tends to decline as domestic exports become more expensive. However, the volume of inflows tends to increase as foreign imports become less expensive.

Effect of Currency Depreciation b.

As a domestic currency depreciates in value or becomes weaker, it becomes less expensive in terms of a foreign currency. As a currency depreciates, the volume of outflows tends to rise as domestic exports become less expensive. However, the volume of inflows tends to decline as foreign imports become more expensive.

The economic exposure created by domestic currency appreciation or depreciation with respect to a foreign currency depends on the net inflow or outflow of foreign currency and is summarized as follows:

	EXAMPLE	
Domestic Currency	Net FX Outflows (Net Exports)	Net FX Inflows (Net Imports)
Appreciates Depreciates	Depreciates Increase	Increase Depreciates

Translation Exposure—Definition and Measurement D.

In addition to the transaction and economic exposures, exchange rate risk is defined in part by translation exposure. Translation exposure is the risk that assets, liabilities, equity, or income of a consolidated organization that includes foreign subsidiaries will change as a result of changes in exchange rates. Translation exposure is generally defined by the degree of foreign involvement, the location of foreign subsidiaries, and the accounting methods used and measured in relation to the effect on the organization's earnings or comprehensive income.

Degree of Foreign Involvement

Translation exposure increases as the proportion of foreign involvement by subsidiaries increases.

EXAMPLE

Domestic International, Inc. has no foreign subsidiaries but is deeply involved in exporting to neighboring countries. Global International, Inc. has 12 foreign subsidiaries that, combined, make up 65 percent of consolidated revenues. Domestic International has less translation exposure than Global International because it has no foreign subsidiaries. Domestic's international business does expose the company to exchange rate risks, however, in terms of both transaction and economic exposure.

Because of Global International's extensive foreign operations, the parent has significant exposure to foreign currency translation exposure, and depending on the entity's export/import activity, Global International may also be exposed to foreign exchange transaction and economic risks.

2. Locations of Foreign Investments

Measurements of financial results of foreign investments frequently occur in the foreign currency in which the investee company operates. The exposure of the parent company to translation risk is affected by the stability of the foreign currency in comparison to the parent's domestic currency. The more stable the exchange rate, the lower the translation risk. The more volatile the exchange rate, the higher the translation risk.

IV. FINANCIAL RISK MANAGEMENT—EXCHANGE RATE TRANSACTION EXPOSURE

Businesses have various methods of managing the transaction exposure associated with exchange rate risks. The use of financial instruments and hedging attempts to mitigate the effect of exchange rate fluctuations on individual transactions. The following discussion analyzes hedging as it relates to foreign currency transactions.

A. Measuring Specific Net Transaction Exposure

Net transaction exposure is the <u>amount of gain or loss that might result from either a favorable or an unfavorable settlement of a transaction.</u>

Selective Hedging - Reduce visk

Hedging is a financial risk management technique in which an organization, seeking to mitigate the risk of fluctuations in value, acquires a financial instrument that behaves in the opposite manner from the hedged item. In effect, hedging is a process of reducing the uncertainty of the future value of a transaction or position (e.g., asset, liability, income) by actively engaging in various derivative investments.

EXAMPLE

Worldwide Sweet Peaches buys shipping crates for its product from Mexico. The company incurs liabilities denominated in pesos that it satisfies in pesos bought with U.S. dollars at the time of transaction settlement. The company incurs a significant liability in pesos at a spot rate of \$0.10. Worldwide management expects that the peso will strengthen to \$0.20 by the time the bill is due and thereby double its cost. To mitigate this perceived transaction risk, the company decides to hedge its position by locking in the current peso spot rate of \$0.10.

2. Identifying Net Transaction Exposure

Consolidated entities consider their net transaction exposure prior to considering hedge strategies. Net transaction exposure considers the effect of transaction exposure on the entity taken as a whole rather than on individual subsidiaries. Although exchange rate issues might adversely affect one subsidiary, they might favorably affect another. The net transaction exposure is the aggregate exposure associated with a particular foreign currency for a particular time and is computed as follows:

- a. Accumulate the inflows and outflows of foreign currencies by subsidiary.
- b. Consolidate the effects on the subsidiary by currency type. Net A/R or A/P
- c. Compute the <u>net effect in total</u>. Appropriately heage

3. Adjusting Invoice Policies

International companies may hedge transactions without complex instruments by timing the payment for imports with the collection from exports.

B. Techniques for Transaction Exposure Mitigation

The following hedge transactions are used to mitigate exchange rate risk presented by foreign currency transaction exposure.

1. Futures Hedge

A futures hedge entitles its holder to either purchase or sell a particular number of currency units of an identified currency for a negotiated price on a stated date. Futures hedges are denominated in standard amounts and tend to be used for smaller transactions.

a. Accounts Payable Application

- (1) Accounts payable denominated in a foreign currency represents a potential transaction exposure to exchange rate risk in the event that the *domestic* currency weakens in relation to the foreign currency. Should the domestic currency weaken relative to the foreign currency, more domestic currency will be required to purchase the foreign currency, thereby increasing the company's cost of settling the liability. If management does not hedge this liability exposure, the company will incur a foreign exchange transaction loss.
- (2) A futures hedge contract to buy the foreign currency at a specific price at the time the account payable is due will mitigate the risk of a weakening domestic currency.

EXAMPLE

Worldwide Sweet Peaches buys crates from Mexico. On the date that Worldwide Sweet Peaches buys crates and incurs a significant liability in pesos, the spot rate is \$0.10. Because the company fears that the peso will strengthen to \$0.20 by the time the bill is due in 30 days, the company enters into a futures contract that will allow it to purchase the pesos needed to pay the liability for \$0.10 per peso in 30 days.

b. Accounts Receivable Application

- (1) Accounts receivable denominated in a foreign currency represent a potential transaction exposure to exchange rate risk in the event that the *domestic* currency strengthens in relation to the foreign currency. Should the domestic currency strengthen, less domestic currency (than originally anticipated from the sale that created the receivable) can be purchased with the foreign currency received. An exchange loss will result.
 - A futures hedge contract to sell the foreign currency received in satisfaction of the receivable at a specific price at the time the accounts receivable is due will mitigate the risk of a strengthening domestic currency.

EXAMPLE

Running Apparel International, a U.S. based retailer, has international retail operations in several countries, including significant business in Japan. Company management expects that the Japanese retail operations will generate and liquidate a significant amount of its accounts receivables in 30 days. Although the current \$/\$ spot rate is \$1/\$98.02, company management expects the \$/\$4 spot rate to be \$1/\$102.09 in 30 days. To mitigate this expected foreign exchange loss caused by the appreciation of the U.S. dollar (relative to the Japanese yen), the company enters into a futures contract to sell yen at the current spot rate (\$1/\$98.02) in 30 days, thereby locking in the current value of these foreign receivables.

A/R - loss

2. Forward Hedge

A forward hedge is similar to a futures hedge in that it entitles its holder to either purchase or sell currency units of an identified currency for a negotiated price at a future point. Although futures hedges tend to be used for smaller transactions, forward hedges are contracts between businesses and commercial banks and normally are larger transactions. Although a futures hedge might hedge a particular transaction, a forward hedge would anticipate a company's needs to either buy or sell a foreign currency at a particular point.

a. Accounts Payable Application

- (1) Accounts payable denominated in a foreign currency represent a potential transaction exposure to exchange rate risk in the event that the *foreign* currency strengthens.
- (2) A forward hedge contract to buy the foreign currency at a specific price at the time accounts payable are due for an entire subsidiary will mitigate the risk of a weakening domestic currency.

b. Accounts Receivable Application

- (1) Accounts receivable denominated in a foreign currency represent a potential transaction exposure to exchange rate risk in the event that the *domestic* currency strengthens.
- (2) A forward hedge contract to sell the foreign currency received in satisfaction of the receivables at a specific price at the time the accounts receivable are due or on the monthly cycle of a particular subsidiary will mitigate the risk of a strengthening domestic currency.

3. Money Market Hedge

A money market hedge uses international money markets to plan to meet future currency requirements. A money market hedge uses domestic currency to purchase a foreign currency at current spot rates and invest them in securities timed to mature at the same time as related payables.

a. Money Market Hedge—Payables (excess cash)

Firms with excess cash use money market hedges to lock in the exchange rate associated with the foreign currency needed to satisfy payables when they come due. Money market hedges for payables satisfaction include the following steps:

- (1) Determine the amount of the payable.
- (2) Determine the amount of interest that can be earned prior to settling the payable.
- (3) Discount the amount of the payable to the net investment required.
- (4) Purchase the amount of foreign currency equal to the net investment required and deposit the proceeds in the appropriate money market vehicle.

EXAMPLE

Duffy's Discount Piñatas has a payable due to its Mexican suppliers in the amount of <u>1,000,000</u> pesos in 90 days. The <u>current exchange rate is \$0.08 per peso</u> and <u>Mexican interest rates are 16 percent</u>. Duffy has \$100,000 in excess cash and elects to use a money market hedge to mitigate transaction exposure to exchange rate risk. Duffy performs the following steps:

- 1. Determine the required investment in pesos at Mexican interest rates: $\frac{1,000,000}{1.04} = \frac{961,538}{1.000}$.
- 2. Purchase 961,538 pesos with \$76,923 (961,538 pesos x 0.08).
- 3. <u>Invest pesos at Mexican interest rates</u> and satisfy payables upon maturity of the investment.

Duffy has secured the satisfaction of its current \$80,000 payable for \$76,923.

b. Money Market Hedge—Payables (borrowed funds)

Firms that do not have excess cash follow the <u>same basic procedure</u> for a money market hedge on payables, <u>except that they first borrow funds domestically and</u> invest them internationally to satisfy the payable denominated in a foreign currency.

EXAMPLE

Duffy's Discount Piñatas has a payable due to its Mexican suppliers in the amount of 1,000,000 pesos in 90 days. The current exchange rate is \$0.08 per peso, Mexican interest rates are 16 percent, and U.S. interest rates are 6 percent. Duffy computes that it must borrow \$76,923 to use a money market hedge to mitigate transaction exposure to exchange rate risk consistent with the first money market hedge example, but has no excess cash. Duffy borrows the needed amount for 90 days in the United States.

Duffy has secured the satisfaction of its current \$80,000 payable for \$78,077 ($76,923 \times 1.015$ or 6% for 90 days).

c. Money Market Hedge—Receivables

A money market hedge used for receivables denominated in foreign currencies effectively involves factoring receivables with foreign bank loans. Foreign currency amounts are borrowed in discounted amounts that are repaid in the ultimate maturity value of the receivable denominated in the foreign currency. Borrowed foreign currency amounts are converted into the domestic currency.

EXAMPLE

Duffy's Discount Piñatas has a receivable from a Mexican customer in the amount of 1,000,000 pesos due in 90 days. The current exchange rate is \$0.08 per peso and Mexican interest rates are 16 percent. Duffy needs available cash and cannot wait to receive \$80,000 in 90 days. Because Duffy needs the money now, the company elects to use a money market hedge technique to expedite collection and mitigate any transaction exposure to exchange rate risk.

Duffy computes that it can borrow 961,538 pesos and convert them to \$76,923 consistent with the first money market hedge example. Duffy borrows the pesos from Mexican financial institutions

Duffy will be able to meet whatever its current cash requirements are in the United States with the \$76,923, and when the 90-day discounted note for 961,538 pesos matures for 1,000,000 pesos, Duffy will satisfy it with the collections from the foreign accounts receivable.

C. Currency Option Hedges

Currency option hedges use the same principles as forward hedge contracts and money market hedge transactions. However, instead of requiring a commitment to a transaction, the currency option hedge gives the business the option of executing the option contract or purely settling its originally negotiated transaction without the benefit of the hedge, depending on which result is most favorable.

1. Currency Option Hedges—Payables - Call option

A call option (an option to buy) is the currency option hedge used to mitigate the transaction exposure associated with exchange rate risk for payables.

a. Similar to a futures contract or forward contract, the business plans to buy a foreign currency at a low rate in anticipation of the foreign currency strengthening in comparison to the domestic currency in order to ensure that it can settle its liability at the predicted value. b. The business has the option (not the obligation) to purchase the security at the option (strike or exercise) price. The business evaluates the relationship between the option price and the exchange rate at the settlement date. Generally, if the option price is less than the exchange rate at the time of settlement, the business will exercise its option. If the option price is more than the exchange rate at the time of settlement, the business will allow the option to expire. Although option premiums are used to compute any net savings associated with option transactions, they are a sunk cost and are irrelevant to the decision to exercise the options.

EXAMPLE /

Gearty International owes its Mexican supplier 1,000,000 pesos due in 30 days. Although the peso is currently exchanged for the U.S. dollar at \$0.08, the company is fearful that the Mexican peso will strengthen in comparison to the dollar before the settlement to as much as \$0.10. Gearty International pays a \$0.005 option premium to secure a call option to buy 1,000,000 pesos in 30 days for \$0.08.

If Gearty is correct in its assessment of international exchange rates and the exchange rate at the time of the settlement (the spot rate) increases as predicted, Gearty will exercise its option to achieve a \$15,000 net savings, computed as follows:

Spot Rate at	Option		Total	Settlement Cost for
Settlement	Price	Premium	Option	1,000,000 Pesos
\$0.10	-	-	-	\$100,000
-	\$0.08	\$0.005	\$0.085	<u>(85,000</u>)
Net savings				<u>\$ 15,000</u>

Gearty's consideration for the option, the \$.005 option premium, is \$5,000 and is paid regardless of whether the option is exercised. The gross savings of \$20,000 [(0.10 -0.08) x 1,000,000 pesos] is reduced by the \$5,000 option premium to reflect a \$15,000 net savings. Because the option premium is a sunk cost, it does not affect the company's decision to exercise the call option.

If Gearty is incorrect in its assessment of international exchange rates and the exchange rates stay constant at \$0.08, then the company will allow its option to expire because exercising the option would actually be equal to simply settling the transaction at the spot rate, computed as follows:

Spot Rate at Settlement	Option Price	Premium	Total Option	Settlement Cost for 1,000,000 Pesos
\$0.08	-	-	-	\$80,000
-	\$0.08	\$0.005	\$0.085	85,000
Loss				(\$ 5,000)

Gearty will likely buy pesos at the spot rate regardless of the loss associated with the premium.

2. Currency Option Hedges—Receivables - Put option

A put option (an option to sell) is the currency option hedge used to mitigate the transaction exposure associated with exchange rate risk for receivables.

a. Similar to a futures contract or forward contract, the business plans to sell a foreign currency at a higher rate, in anticipation of the foreign currency weakening in comparison to the domestic currency, to ensure that it can capitalize on receivable collections at a stable or predicted value.

\$.10



b. The business has the option (not the obligation) to sell the collected amount of the foreign currency from the receivable at the option (strike or exercise) price. The business evaluates the relationship between the option price and the exchange rate at the settlement date. Generally, if the option price is more than the exchange rate at the time of settlement, the business will exercise its put option. If the put option price is less than the exchange rate at the time of settlement, the business will allow the put option to expire. Although premiums are used to compute any net preserved value associated with option transactions, they are a sunk cost and irrelevant to the decision to exercise the options.

A/R EXAMPLE

Gearty International is owed 1,000,000 pesos due in 30 days from its Mexican customer. Although the peso is currently exchanged for the U.S. dollar at \$0.08, the company is fearful that the Mexican peso will weaken in comparison to the dollar before the settlement to as little as \$0.06. Gearty International pays a \$0.005 put premium to secure a put option to sell 1,000,000 pesos in 30 days for \$0.08.

If Gearty is correct in its assessment of international exchange rates and the exchange rate at the time of the settlement (the spot rate) decreases as predicted, the company will exercise its put option to achieve a net preservation of \$15,000 in asset value, computed as follows:

Spot Rate at	Option		Total	Settlement Cost for
Settlement	Price	Premium	Option	1,000,000 Pesos
\$0.06	-	-	-	\$60,000
-	\$0.08	\$0.005	\$0.075	<u>75,000</u>
Net preserved valu	ıe			<u>\$15,000</u>

Gearty's consideration for the put option, the \$0.005 put premium, is \$5,000 and is paid regardless of whether the put option is exercised. The gross value "preserved" of \$20,000 [(0.08 - 0.06) x 1,000,000 pesos] is reduced by the \$5,000 put premium paid to reflect a net \$15,000 preserved receivable value. Because the put premium is a sunk cost, it is not included in the decision to exercise the option.

If Gearty is incorrect in its assessment of international exchange rates and the exchange rates stay constant at \$0.08, then it will allow the put option to expire because to exercise the put option would actually be equal to simply settling the transaction at the spot rate when the receivables are received, computed as follows:

Spot Rate at	Option		Total	Settlement Cost for
Settlement	Price	Premium	Option	1,000,000 Pesos
\$0.08	-	-	-	\$80,000
-	\$0.08	\$0.005	\$0.075	<u> 75,000</u>
Loss				(<u>\$ 5,000</u>)

Gearty will likely sell pesos at the spot rate regardless of the loss associated with the premium.

D. Other Techniques for Transaction Exposure Mitigation—Long-Term Transactions

The following hedge transactions are used to mitigate exchange rate risk presented by transaction exposure.

1. Long-Term Forward Contracts

Mechanically, *long-term forward contracts* deal with the same issues as any other forward contracts. Long-term forward contracts are set up to stabilize transaction exposure over long periods. Long-term purchase contracts may be hedged with long-term forward contracts.

\$.06



→ \$.08

2. Currency Swaps

Transaction exposure associated with exchange rate risk for longer-term transactions can be mitigated with *currency swaps*.

a. Two Firms

Two firms with coincidental needs for international currencies may agree to swap currencies collected in a future period at a specified exchange rate. The two entities essentially swap their currencies in an exchange negotiation completed years in advance of their receipt of the currencies.

b. Financial Intermediaries

Typically, financial intermediaries are contacted to broker or to match firms with currency needs.

EXAMPLE

In order to hedge its future raw material purchases for its Poland operations, A U.S. manufacturing firm (U.S. counterparty) agrees to enter into a currency swap with a Polish multinational firm (foreign counterparty) whereby the U.S. counterparty agrees to provide the following quarterly notional amounts in U.S. dollars to the foreign counterparty in exchange for the following quarterly notional amounts in Polish zlotys.

Quarter End	U.S. Counterparty Receives	Foreign Counterparty Receives
1	1,500,000 zloty	500,000 USD
2	900,000 zloty	300,000 USD
3	750,000 zloty	250,000 USD
4	1,800,000 zloty	600,000 USD

Assuming the exchange rates are 3.25 zloty/1.0 USD and 2.85 zloty/1.0 USD at the end of quarter 1 and quarter 2, respectively, what is the U.S. manufacturing firm's foreign currency gain or loss recorded at the end of the first and second quarters on the currency swap?

Solution:

The U.S. manufacturing firm (U.S. counterparty) entered into a fixed notional amount currency swap with a foreign counterparty when the exchange rates were 3.0 zloty/1.0 USD. Because the contractual quarterly payments made in U.S. dollars to the Polish firm are fixed at that exchange rate throughout swap, any movement up or down of these two exchange rates will result in a foreign currency gain or loss.

In the first quarter, the U.S. dollar appreciates versus the Polish zloty, so the U.S. counterparty incurs a foreign currency loss as follows:

In the event the U.S. firm chose not to enter into the currency swap, investing 500,000 USD at the end of the first quarter would have provided 1,625,000 zloty (3.25 zloty/1.0 USD x 500,000 USD).

In the second quarter, the U.S. dollar depreciates versus the Polish zloty, resulting in the following foreign exchange gain for the U.S. counterparty (relative to the 3.0 zloty/1.0 USD transaction exchange rate).

In the event the U.S. firm chose not to enter into the currency swap, investing 300,000 USD at the end of the second quarter would have provided 855,000 zloty (2.85 zloty/1.0 USD x 300,000 USD).

3. Parallel Loan

Two firms may mitigate their transaction exposure to long-term exchange rate loss by exchanging or swapping their domestic currencies for a foreign currency and simultaneously agreeing to re-exchange or repurchase their domestic currency at a later date.

E. Other Techniques for Transaction Exposure Mitigation—Alternative Hedging Techniques

The following hedge transactions are used to mitigate exchange rate risk presented by transaction exposure.

1. Leading and Lagging

Leading and lagging represent transactions between subsidiaries or a subsidiary and a parent. The entity that is owed may bill in advance if the exchange rate warrants (leading) or possibly wait until the exchange rate is favorable before settling (lagging).

2. Cross-Hedging

The technique known as *cross-hedging* involves hedging one instrument's risk with a different instrument by taking a position in a related derivatives contract. This is often done when there is no derivatives contract for the instrument being hedged, or when a suitable derivatives contract exists but the market is highly illiquid.

3. Currency Diversification

The simplest hedge for long-term transactions is to diversify foreign currency holdings over time. A substantial decline in the value of one currency would not affect the overall dollar value of the firm if the currency represented only one of many foreign currencies.

V. EXCHANGE RATE RISK—MANAGING ECONOMIC AND TRANSLATION EXPOSURE

Businesses have various methods of managing the economic and translation exposure associated with exchange rate risks. Generally, the use of organization-wide solutions related to the entity itself and related reporting requirements are included in the approach.

A. Assessing Economic Exposure

Economic exposure is defined by the degree to which cash flows of the business can be affected by fluctuations in exchange rates. The extent to which revenues and expenses are denominated in different currencies could seriously affect the profitability of an organization and represents economic exposure.

EXAMPLE

Pete's Primo Piñatas manufactures piñatas in Mexico. The company's expenses paid to local suppliers are denominated in the peso. The company exports nearly 80 percent of its product to the United States and receives revenues denominated in U.S. dollars from upscale Mexican theme-party planners. If the peso were to strengthen in relation to the dollar, then import revenues could be significantly less than domestic expenses. Pete's Primo Piñatas would suffer economic losses as a result of its economic exposure to exchange rate risk.

B. Techniques for Economic Exposure Mitigation

Economic exposures typically relate to organization-wide issues and can usually only be mitigated with organization-wide approaches that involve restructuring and adjustments to the business plan.

1. Restructuring

Economic exposure to currency fluctuations can be mitigated by restructuring the sources of income and expense to the consolidated entity.

a. Decreases in Sales

A company fearful of a depreciating foreign currency used by a foreign subsidiary may elect to reduce foreign sales to preserve cash flows.

b. Increases in Expenses

A company anticipating a depreciating foreign currency may elect to increase reliance on those suppliers to take advantage of paying for raw materials or supplies with cheaper currency.

2. Characteristics of Restructuring and Economic Exposure

Restructuring tends to be more difficult than ordinary hedges. Economic exposures to exchange rate fluctuations are viewed as more difficult to manage than transaction exposures.

VI. FINANCIAL RISK MANAGEMENT—TRANSFER PRICING - Between related parties

International businesses will likely transact business between the subsidiaries that cross political boundaries or between the domestic parent and foreign subsidiary. Valuation of these transactions involves transfer pricing. Transfer pricing decisions serve the purpose of minimization of local taxation while remaining within the guidelines of foreign or other host governments.

A. Intercompany Transactions—Relative Tax Rates

Transfer prices (selling prices) in countries with higher tax rates will be reduced to optimum levels.

- 1. Transfer selling prices in countries with higher taxes increase the tax burden but also increase the tax protection afforded to foreign subsidiaries operating in other countries, even if those subsidiaries have lower rates.
- 2. Transfer prices should be set up to maximize consolidated benefit, reduce income in countries with higher taxes, and maximize the tax shield in countries with lower taxes.

B. Intercompany Cash Transfers

Intercompany cash transfers are often managed through the use of leading and lagging.

1. Strong Cash Position

Subsidiaries with a *strong cash position* tend to follow a "leading" transfer policy and pay other subsidiaries in advance.

2. Weak Cash Position

Subsidiaries with a *weak cash position* tend to follow a "lagging" transfer policy under which they would pay richer subsidiaries long after obligations were incurred as a means of preserving cash.

FINANCIAL DECISIONS

I. SHORT-TERM AND LONG-TERM FINANCING DECISIONS

Although most companies employ some form of long-term financing as a means to meet their capital requirements, using short-term financing is considered a viable option. Permanent working capital sources may be employed to meet a company's long-term needs, while temporary working capital will be used to meet short-term or seasonal needs. The use of long-term or short-term financing to meet capital needs has different effects on a company. Companies compare choices that provide higher risk, lower cost, and increased profitability with choices offering lower risk, higher cost, and reduced profitability.

A. Short-Term Financing Strategies and Factors

1. Characteristics

Short-term financing is generally classified as current and will mature within one year.

a. Rates

Rates associated with short-term financing tend to be lower than long-term rates and presume greater liquidity on the part of the organization using short-term financing.

b. Strategies

The extent to which an organization uses short-term financing strategies is dependent on both the amount of current assets it maintains and the risk tolerance of management. Shorter-term financing strategies anticipate higher levels of temporary working capital that require greater agility and flexibility.

2. Advantages

a. Increased Liquidity

Short-term financing presumes higher turnover of financing instruments and matching of receipts (liquidation of assets) and disbursements (liquidation of liabilities) within a year.

b. Increased Profitability

Rapid conversion of operating cycle components (e.g., inventory, receivables) into cash carries the potential of increased profitability (and improved liquidity).

c. <u>Decreased Financing Cost</u>

Short-term interest rates are generally lower than long-term interest rates given the shorter duration of the financing instruments.

3. Disadvantages

a. <u>Increased Interest Rate Risk</u>

Interest rates may abruptly change, and given shorter maturities, may require greater financing charges than anticipated on future refinancing.

b. Decreased Capital Availability

Lender evaluation of creditworthiness may change and thereby make financing impossible or less favorable by virtue of increased rates and/or less favorable terms.

B. Long-Term Financing Strategies and Factors

1. Characteristics

Long-term financing is generally classified as noncurrent and will mature after one year.

a. Rates

Rates associated with long-term financing tend to be higher than short-term rates and presume less liquidity on the part of the organization using long-term financing.

b. Strategies

The extent to which an organization uses long-term financing strategies is dependent on both the amount of current assets it maintains and the risk tolerance of management. Longer-term financing strategies anticipate higher levels of permanent working capital. Additionally, company management may expect more volatile interest rates or reduced capital availability in the financial markets.

2. Advantages

a. Decreased Interest Rate Risk

For the borrower, long-term financing locks in an interest rate over a long period, thereby reducing the exposure to fluctuations in rates.

b. Increased Capital Availability

Securing long-term debt guarantees financing over a long period and reduces the company's exposure to any risk that refinancing might be denied or modified with less favorable terms.

3. Disadvantages

a. <u>Decreased Profitability</u>

Higher financing costs in combination with an increased time span for conversion of operating cycle components into cash reduces profitability (and liquidity).

b. Decreased Liquidity

Longer-term financing commits organizations to payments over a longer period and thereby reduces flexibility and liquidity.

c. Increased Financing Costs

Long-term debt generally carries a higher interest rate given the longer duration of the financing instruments.

(1) Interest Rate Risk—Lender's Perspective

For the lenders, a higher interest rate is charged for longer-term debt because the likelihood that interest rates will change over the period of the loan increases as the term of the loan increases. Higher financing charges compensate the lender for increased interest rate risk. Therefore, the lenders recognize their exposure to interest rate risk with long-term financing and charge a premium to the borrower in the form of higher rates.

(2) Interest Rate Risk—Borrower's Perspective

The borrowers, on the other hand, lock themselves into a long-term interest rate to reduce their exposure to interest rate risk, and pay a premium to do so.



PASS KEY

<u>Short-term debt</u> <u>Long-term debt</u>

Rates: Lower Higher

Advantages: Increased liquidity Decreased interest rate risk

Increased profitability Increased capital availability

Disadvantages: Increased interest rate risk Decreased liquidity

Decreased capital availability

Use with higher levels of temporary

Use with higher levels of

working capital permanent working capital

C. Specific Short-Term or Long-Term Financial Instruments

1. Working Capital Financing

Strateav:

a. Definition

Working capital financing involves the spontaneous financing of current assets with trade accounts payable and accrued liabilities, with the expectation that the maturities of current assets (collections) will coincide with the maturities of current liabilities (disbursements), often termed maturity matching.

EXAMPLE

WUTFUN Toy Company maintains a permanent inventory of toys year-round but dramatically increases its inventory in November and December in anticipation of increased sales during the holidays. Generally, the company carries few receivables but extensive inventory. Longer-term financing is used for its permanent inventory needs while shorter-term financing, particularly accounts payable, is used to finance seasonal requirements. Use of longer-term financing is appropriate for permanent inventory when sales are light, and use of shorter-term financing is appropriate as inventory levels are increased and then liquidated. Clearly, WUTFUN is exposed to higher levels of risk at year-end in the event that inventory is not sold, profit margins are not realized, and inventory must be permanently financed or liquidated at reduced or negative margins.

2. Letter of Credit

a. Definition

A letter of credit represents a third-party guarantee, generally by a bank, of financial obligations incurred by the company. Letters of credit represent an external credit enhancement used by a company issuing otherwise unsecured debt to enhance its credit or can be required by a creditor to ensure payment.

EXAMPLE

WUTFUN Toy Company is stocking up for its year-end inventory requirements and seeks to issue commercial paper to its suppliers upon delivery of stock. Toy wholesalers anticipate weak sales and are reluctant to accept unsecured debt. WUTFUN arranges for a letter of credit to guarantee payment of its indebtedness in order to ensure delivery of inventory.

3. Line of Credit

a. Definition

A line of credit represents a revolving loan with a bank or group of banks that is up to a specific dollar maximum amount, for a defined term, and is renewable upon the maturity date. Any outstanding balances under the line of credit reduce the future availability of funds that may be drawn by the company under that line. Lines of credit that are drawn represent a loan from the bank(s).

A company may also have a seasonal revolving credit facility that allows additional capital availability for a limited time period. Seasonal revolving credit facilities are used by companies during periods of high working capital needs.

EXAMPLE

Lacey's Stores Inc. is a soft goods general retailer. Through the first six month of the current operating year, the company's has been able to cover its operating costs and working capital needs through its internal cash flow generation and the issuance of commercial paper. As the Summer season begins to wind down, the retailer is planning a significant buildup of retail inventory for the upcoming holiday season. In order to obtain the necessary capital for this working capital expansion, the retailer draws down 80 percent of the availability under its master revolving line of credit facility. Several months later, Lacey's uses its seasonal revolving line of credit to cover its additional retail inventory needs. As the holiday season ends, the retailer pays down all outstanding balances under the master revolving credit facility and seasonal revolving line of credit (which is subsequently terminated at operating year-end).

4. Leasing Options

a. Definitions

A lease represents a contractual agreement in which the owner of an asset, the lessor, allows another party, the lessee, to use the property (asset) in exchange for periodic lease payments.

- (1) Operating leases are those instances in which a property is rented over an insignificant portion of the asset's useful life with no obligation (or opportunity) to assume ownership of the property. Operating leases are considered off-balance sheet financing for the lessee, as there is no balance sheet effect with the periodic rent payments reflected as rent expense on the income statement. Companies that use operating leases (versus capital leases) will have stronger financial ratios because liabilities are lower (debt off-balance sheet) and, in the early years of the lease, rent expense is lower than the combined depreciation expense and interest expense reported under a capital lease.
- (2) Capital (or finance leases per IFRS) are analogous to a lessee buying an asset and financing it with debt. The lessee records the present value of the minimum lease payments as an asset on its balance sheet as well as the corresponding current and long term lease obligations. Instead of recording rent expense on the income statement, the lessee records both depreciation expense and interest expense under a capital lease. Generally, (lessee) firms that desire to report higher periodic operating cash flows prefer using capital leases over operating leases because the principal portion of the capital lease payment is reported as a financing cash outflow, while the entire (rent) payment under an operating lease is reported as an operating cash outflow. In order to classify a lease as a capital lease, a lessee must meet one of the following four criteria:



<u>O</u>wnership transfer at the end of lease



• **W**ritten option for bargain purchase



• <u>N</u>inety (90 percent) percent of lease property FV ≤ PV of lease payments



 <u>S</u>eventy-five (75 percent) or more of the asset's economic life is committed in the lease term If none of the above criteria are met, the lessee must treat the lease as an operating lease.

EXAMPLE

Phillips Manufacturing Company is working on its strategic plan for the upcoming year. Due to increased product demand, the company must expand its manufacturing by either constructing a new building or leasing an existing manufacturing facility for the next five years. Management carefully weighs both options and recommends leasing the facility using an operating lease based on the following factors: 1) there are tax advantages offered by leasing, given Phillips' existing marginal tax rates; 2) the company has high financial leverage, and operating lease structure will be used to keep additional debt off-balance sheet; 3) the use of an operating lease will improve the company's return on invested capital ratios; and 4) local real estate prices have been highly volatile. Leasing provides additional flexibility, allowing management to reassess the lease versus buy decision and the level of product demand in five years.

5. Debentures and Bonds

Fixed cost + Maturity date

New debt — ↓creditworthiness

No new owners — ↑EPS

a. Definitions—General

Debentures and bonds represent longer-term indebtedness that is generally supported by formalized agreements known as indentures, which specify the terms and conditions of the bond, including the coupon rate and the maturity date. Bonds are frequently administered by a trustee, who acts as a third-party representative of the bondholder. Debentures are unsecured, and bonds are often secured by either revenue pledges or asset pledges.

b. Debentures

A debenture represents an unsecured obligation of the issuing company. In the event of default, the holder of a debenture has the status of a general creditor. Risks associated with debentures may be mitigated by a negative-pledge clause that stops a company from pledging assets to additional debt.

c. Subordinated Debentures

A subordinated debenture is a bond issue that is unsecured and ranks behind senior creditors in the event of an issuer liquidation. Subordinated debentures command higher interest rates than debentures to allow for additional risk.

d. Income Bonds

Income bonds represent securities that pay interest only upon achievement of target income levels. Income bonds represent a risky bond that typically only is used in reorganizations.

e. Junk Bonds

Junk bonds are characterized by high default risk and high return. Junk bonds are classified as "noninvestment grade" bonds by the major credit rating agencies given their more likely default on principal and/or interest payments by the issuer. Junk bonds are frequently used to raise capital for acquisitions and leveraged buyouts.

EXAMPLE

Rust Belt Industries is looking to close its machinery plant in the small town of Oxidation, Ohio. The company is the only major employer in Oxidation. To preserve their way of life, employees have decided to buy the company from its current owners. The group of employees completed a leveraged buyout of the owners by issuing non-investment grade (junk) bonds.

f. **Mortgage Bonds**

A mortgage is a loan that is secured by residential or commercial real property. Mortgages are usually pooled together and issued as mortgage bonds, with bondholders protected from default by a lien on the pooled real property assets. A distinguishing feature of mortgage bonds is that trustees act on behalf of bondholders to foreclose on mortgage assets in the event of default.

6. **Equity Financing**

Variable cost + No maturity Improve creditworthiness

Equity financing involves the issuance of equity (stock) securities that represent different forms of ownership of the company. A distinguishing feature of equity securities is that their right to a firm's assets in a bankruptcy (liquidation) is below both secured and unsecured bondholders.

b. **Preferred Stock**

Definitions—General

Preferred stock is a hybrid equity security that has features similar to both debt and equity. Preferred shares offer or require a fixed dividend payment to their holders, which is similar to coupon payments made on debt instruments. They are like equity because the timing of the dividend payment is at the discretion of the board of directors (not mandatory) and the dividend payments are not tax-deductible. Preferred shares may have the following features and uses:

Cumulative Dividends

A cumulative provision on preferred stock may require that (unpaid) *dividends* in arrears on preferred stock from a prior period be paid prior to the distribution of common stock dividends.

(2) Participating Feature

Preferred shares may participate in declared dividends along with common shareholders to the extent that undistributed dividends exist after satisfying both preferred dividend requirements and common shareholder requirements at the preferred dividend rate.

(3) Voting Rights

In rare circumstances, preferred shares are given voting rights. Usually these situations are associated with dividends in arrears for significant periods.

Common Stock C.

Common stock represents the basic equity ownership security of a corporation. Common stock includes voting rights with optional dividend payments by the issuer. Most common stock is issued with a stated par value. When the common stock is issued at a given market price, the proceeds received by the issuer are separated between the common stock account (e.g., par value times the number of shares issued) and the additional paid-in capital account. A negative feature of common equity is that common shareholders have the lowest claim to a firm's assets in a liquidation.



PASS	KEY	
The following table summarizes some of the general characteristics of debt and equity financing:		
<u>De</u>	<u>ebt</u>	<u>Equity</u>
Flexibility	0	Yes
Tax deductibility Ye	·s	No
EPS dilution No	o	Yes
Increased financial risk Ye	·s	No
Security issuance costs Lo	w	High
Investor return Fix	xed	Variable
Security issuance costs Lo)W	High

II. DEBT COVENANTS

Creditors use debt covenants in lending agreements to protect their interests by limiting or prohibiting the actions of debtors that might negatively affect the positions of the creditors. Covenants contained in a lending agreement may be positive or negative. A positive covenant may include the requirement that the issuer provides quarterly financial reporting (information) to the investors, while a negative covenant may involve a restriction on asset sales for a stipulated time frame. When issuing debt instruments, company management should consider the potential effect of debt covenants on a firm's solvency, as too restrictive covenants could hinder the company's basic operating decisions.

A. Common Debt Covenants

Debt covenants vary widely. Common debt covenants include:

- 1. Limitations on issuing additional debt
- 2. Restrictions on the payment of dividends
- 3. Limitations on the disposal of certain assets
- 4. Minimum working capital requirements
- 5. Limitations on how the borrowed money can be used
- 6. Maintenance of specific financial ratios, including:
 - a. Minimum fixed charge coverage ratio
 - b. Maximum debt- to- total capital ratio (debt ratio)
 - c. Maximum debt-to-EBITDA ratio (cash flow coverage)
 - d. Minimum interest coverage ratio (times interest earned)
- 7. Providing monthly, quarterly, or annual financial statements to bondholders (lenders)

B. Violation of Debt Covenants

When debt covenants are violated, the debtor is in technical default and the creditor can demand repayment of the entire principal. Most of the time, concessions are negotiated and real default, as opposed to technical default, is avoided. Concessions can result in the violated covenant(s) being waived temporarily or permanently. Concessions also can result in a change in the interest rate or other terms of the debt.

FINANCIAL VALUATION

METHODS OF CALCULATING SECURITY VALUATIONS I.

Traditional financial valuation is based on the formula for the present value of an annuity. The formula is somewhat complex, but is applied in various forms through the financial management topic. Alternative valuation methods use variations of the price earnings (P/E) ratio. It is important to understand the valuation formulas, the implied assumptions of the formulas, and the effect of the behavior of financial managers on the evaluation of those assumptions.

Annuities Α.

An annuity is a series of equal cash flows to be received over a number of periods. The traditional approach to asset valuation is the annuity present value formula, which divides future cash flows by a rate of return in order to determine the value of the annuity in today's dollars.

1. **Calculating the Present Value of an Annuity**

Annuity present value = $C \times (1 - Present value factor / r)$

$$= C \times (1 - [1 / (1 + r)^t] / r)$$

Terms are defined as follows:

C = Amount of annuity (equal future cash flows)

r = Rate of return

t = Number of years

n = # periods i = Interest rate Apples-to-apples

Assumptions

Key assumptions implied by the variables of the formula include:

Recurring Amount of the Annuity a.

The amount of the periodic annuity must be specified (e.g., \$10,000 per year).

Appropriate Discount Rate b.

> Assumptions must specify the discount rate (e.g., the company requires a 15 percent return per year).

Duration of the Annuity C.

> Assumptions must specify how long the annuity will continue (e.g., 2 years, 10 years, or even perpetuity, etc.).

d. **Timing of the Annuity**

> An annuity may be received or paid in any number of ways. Assumptions must specify if the annuity payment occurs monthly, quarterly, annually, etc. The assumptions must also specify if the annuity occurs at the beginning or the end of the period.

B. Perpetuities—Zero Growth Stock

When the periodic cash flows paid by an annuity last forever, the annuity is called a perpetuity or perpetual annuity. The traditional annuity formula for perpetual cash flow streams is simplified, because no duration is known. When a company is expected to pay the same dividend each period, the perpetuity formula can be used to determine the value of the company's stock.

1. Per Share Valuation

Present value of a perpetuity = Stock value per share = P = D/R

Terms are defined as follows:

P = Price

D = Dividend

R = Required return

2. Assumptions

- a. The assumptions must specify the dividend (and assume it will never change).
- b. The assumptions must specify the required return.

EXAMPLE

Baker Company pays a dividend of \$5 per year. Able wants to invest in Baker and earn a 20 percent return. What should Able pay for Baker?

P = D / R

P = \$5 / 20%

P = \$25

Able should pay \$25 for a share of Baker

C. Constant (Gordon) Growth Dividend Discount Model (DDM)

The dividend discount model assumes that dividend payments are the cash flows of an equity security and that the intrinsic value of the company's stock is the present value of the expected future dividends. If dividends are assumed to grow at a constant rate, the constant (Gordon) growth DDM can be used to determine the value of the company's stock.

1. Per Share Valuation With Assumed Growth

a. Value (price) of Equity Formula

$$P_{t} = D_{(t+1)} / (R - G)$$

Terms are defined as follows:

P₊ = Current price (price at period "t")

 $D_{(t+1)}$ = Dividend one year after period "t"

R = Required return

G = (Sustainable) Growth rate

 $P_o = \frac{D^1}{R - G}$

The candidate may be given the dividend at time = 0 or D_0 . To determine D_1 , the numerator of the formula becomes: $D_0(1 + G)$

b. Determining the Required Rate of Return (R)

The Capital Asset Pricing Model (CAPM) is often used to determine the expected required return for the DDM model as follows: Equity visk premium

$$R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$$

Where:

 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta$
 $R_{ce} = R_f + \beta_i [(E(R_m) - R_f)] = Risk + \beta_i [(E(R_m) - R_f)]$

R_ = Required rate of return on the (common) equity security

R_f = Risk-free rate of return

 β_i = Beta on the security

E(R_) = Expected return on market (portfolio)

Under the CAPM formula, the $[E(R_m) - R_f]$ term is also known as the equity risk premium.

2. **Assumptions**

- a. The assumptions must specify (or allow for the calculation of) dividends one year beyond the year in which you are determining the price.
- b. The assumptions must include a required return.
- c. The assumptions must include a constant growth rate of dividends.
- d. The formula implies that the stock price will grow at the same rate as the dividend, in perpetuity.
- e. The formula assumes that the required rate of return is greater than the dividend growth rate. If this relationship does not hold true, the formula will not work.

Baker Corporation pays a current dividend of \$5 per year and is projected to grow at 4 percent per year. Able wants to invest in Baker and earn a 20 percent return. What should Able pay for Baker today? $D_{0} = \$5$ $P_{t} = D_{(t+1)} / (R - G)$ $D_{(t+1)} = \$5 \times 1.04$ $D_{(t+1)} = \$5.20$ $P_{t} = \$5.20 / (0.20 - 0.04)$ $P_{t} = \$5.20 / (0.16)$ $P_{t} = \$32.50$ The intrinsic value of Baker's stock today is \$32.50.

EXAMPLE

EXAMPLE

Baker Corporation pays a current dividend of \$5 per year and is projected to grow at 4 percent per year. Able wants to invest in Baker and earn a 20 percent return. What will Able pay for Baker three years from today?

years from today?
$$P_{t} = D_{(t+1)} / (R - G)$$

$$D_{(t+1)} = \$5 \times 1.04 \times 1.04 \times 1.04 \times 1.04, \text{ or}$$

$$D_{(t+1)} = \$5 \times (1.04)^{4}$$

$$D_{(t+1)} = \$5 \times 1.1698586$$

$$D_{(t+1)} = \$5.85$$

$$P_{t} = D_{(t+1)} / (R - G)$$

$$P_{t} = (\$5.85) / (0.20 - 0.04)$$

$$P_{t} = \$5.85 / (0.16)$$

$$P_{t} = \$36.56$$

$$D_{t} = \$36.56$$

In order to value Baker in three years, the dividend to be paid in the fourth year is required. Able should pay \$36.56 for Baker in three years.

D. Price Multiples

Price multiples represent ratios of a stock's market price to another measure of fundamental value per share. Investors effectively use price multiples to evaluate the price of a stock and ultimately determine if it is undervalued, fairly valued, or overvalued by incorporating what a share of stock buys relative to earnings, sales, cash flow, or another measure provided on a per share basis.

Once an analyst calculates a set of price multiple ratios for a given company (stock), these ratios are used as a method of comparison to the same corresponding ratios calculated for similar companies (stocks) within that industry sector to determine a ranking for each price multiple ratio and ultimately provide important input into a particular company's stock valuation.

1. Price-Earnings (P/E) Ratio

The P/E ratio is the most widely used multiple when valuing equity securities. The rationale for using this measure is that earnings is a key driver of investment value (stock price). This multiple is widely used by the investment community and empirical research has shown that changes in a company's P/E's are tied to the long-run stock performance of that company.

a. Calculating the P/E Ratio

$$P/E$$
 Ratio = P_0/E_1

Terms are defined as follows:

P₀ = Price or value today

 E_1 = EPS expected in one year (next 4 quarters) = $E_0 \times (1 + G)$

Note: the above formula is termed the "forward P/E" as the denominator is based on expected earnings over the next year or four quarters.

b. Valuing Equity With the P/E Ratio

The P/E ratio, once calculated, can be multiplied by anticipated future earnings in order to determine the current stock price. It requires that earnings be greater than zero.

EXAMPLE

Assume Baker Corporation has current-year earnings per share of \$1.50 and anticipates earnings per share in the coming year of \$2. If the P/E ratio is 7.5x, the current stock price is calculated as follows:

$$P_0 = P_0 \times E_1$$
 $P_0 = P_0 \times E_1$
 $P_0 = P_0 \times E_1$

The P/E ratio of 7.5x implies that the current stock price should be 7.5x the anticipated earnings per share of \$2. An investor would expect the current stock price to therefore be \$15.

c. Trailing vs. Forward P/E

The numerator in the P/E ratio is unambiguous, as the stock price for publicly traded companies is readily available. This is not the case for the denominator of the ratio, as the earnings used in the P/E ratio can either be past earnings or expected future earnings.

When past earnings are used in the P/E ratio, such as earnings for the past four quarters or trailing twelve month EPS, the ratio calculated is the *trailing P/E*. When the expected earnings of the company next year is used in the denominator, the ratio is the *forward P/E*.

The trailing P/E is the preferred calculation method when a company's forecasted earnings are unavailable, while the forward P/E is the preferred method when the company's historical earnings is not representative of its future earnings. The formula for the trailing P/E ratio is as follows:

Trailing P/E Ratio =
$$P_0 / E_0$$

Terms are defined as follows:

P₀ = Price or value today

 E_0 = EPS for the past year (past 4 quarters)

2. PEG Ratio

The PEG ratio is a measure that shows the effect of earnings growth on a company's P/E, assuming a linear relationship between P/E and growth. Generally, stocks that have lower PEG ratios are more attractive to investors than stocks that have higher PEG ratios.

a. Calculating the PEG Ratio

$$PEG = (P_0 / E_1) / G$$

Terms are defined as follows:

P_o = Price or value today

E, = Expected earnings in one year

G = growth rate = 100 x expected growth rate

b. Valuing Equity With the PEG Ratio

The PEG ratio calculates the P/E ratio per unit of growth. The PEG ratio can be multiplied by both forecasted future earnings and the growth rate to determine the current price of the stock.

$$(P_0) = PEG \times E_1 \times G$$

Terms are defined as follows:

P_o = Price or value today

E₁ = Expected earnings in one year

G = Growth rate = 100 x expected growth rate

EXAMPLE

Baker wants to use the PEG ratio to project the price of its stock. The company's PEG ratio is 2.5x and its current earnings per share is \$5. The growth rate for earnings is anticipated to be 4 percent. The projected price of Baker's shares would be computed as follows:

$$E_1 = 5.00 \times 1.04 = $5.20$$
 $P_0 = PEG \times E_1 \times G$
 $(P_0) = PEG \times E_1 \times G$ $= 2.5 \times 5.20×4
 $(P_0) = 52.00 $= 52.00

3. Price-to-Sales Ratio

Similar to the P/E ratio, this price multiple ratio can be used to forecast the current stock price. The rationale for using the price-to-sales ratio is that sales are less subject to manipulation than earnings or book values, sales are always positive so this multiple can be used even when EPS is negative, and this ratio is not as volatile as the P/E ratio, which includes the effect of financial and operating leverage. Empirical studies have shown that P/S is an appropriate measure to value stocks that are associated with mature or cyclical companies.

a. Calculating the Price-to-Sales Ratio

Price-to-Sales Ratio = P_0 / S_1

Terms are defined as follows:

P_o = Price or value today

S₁ = Expected sales in one year

b. Valuing Equity With the Price-to-Sales Ratio

The value of equity can then be calculated as follows:

$$(P_0) = (P_0 / S_1) \times S_1$$

4. Price-to-Cash-Flow Ratio

The price-to-cash-flow ratio may also be used to calculate the current stock price. The rationale for using this price multiple is that cash flow is harder for companies to manipulate than earnings, P/CF is a more stable measure than P/E, and empirical research has shown that changes in a company's P/CF ratios over time are positively related to changes in a company's long-term stock returns.

a. Calculating the Price-to-Cash-Flow Ratio

Price-to-Cash-Flow Ratio = P₀ / CF₁

Terms are defined as follows:

 P_0 = Price or value today

CF₁ = Expected cash flow in one year

b. Valuing Equity With the Price-to-Cash-Flow Ratio

The value of equity can then be calculated as follows:

$$(P_0) = (P_0 / CF_1) \times CF_1$$

5. Price-to-Book Ratio

The price-to-book (P/B) ratio is another price multiple used by analysts that focuses on the balance sheet versus the income statement or statement of cash flows. The rationale for using this multiple is that a firm's book value of common equity (assets minus liabilities and preferred stock) is more stable than earnings per share, especially when a firm's EPS is extremely high or low for a given period. Because P/B is usually positive, this multiple can be used even when a firm's EPS is negative or zero. Research indicates that the P/B ratio can explain a firm's average stock returns over the long-run.

a. Calculating the P/B Ratio

$$P/B$$
 Ratio = P_0/B_0

Terms are defined as follows:

P₀ = Price or value today

B_o = Book value of common equity

b. Valuing Equity With the P/B Ratio

The value of equity can then be calculated as follows:

$$(P_0) = (P_0 / B_0) \times B_0$$

EXAMPLE

G

An analyst assembles the following financial and market data for Bolden Corporation's most recent yearend. The analyst projects that the firm's operating cash flow will increase 20 percent in the upcoming year.

Market Data:

Common stock price \$18 Common shares outstanding 10,000,000

Financial Data:

Total assets \$250,000,000 Total liabilities \$110,000,000 Preferred stock \$20,000,000 Common stock \$25,000,000 \$45,000,000 Additional paid-in capital \$50,000,000 Retained earnings \$140,000,000 Total stockholders' equity $$25,000,000 = CF_0 \times (1 + G)$ Cash flow from operations

Using the above data, the P/B multiple for Bolden Corporation's current year is derived as follows:

1. Determine book value of common equity

2. Determine book of common equity per share

mine book of common equity per share
$$\frac{P_0}{B_0} = \frac{\$18}{\$12}$$
 = 1.5× at a P/B multiple

3. Calculate P/B multiple

$$P_0/B_0 = $18 / $12$$

= 1.5

Based on the above data and the analyst's operating cash flow forecast, the P/CF multiple is derived as follows:

1. Determine the firm's expected cash flow per share the following period

$$CF_1 = $25,000,000 \times 1.20 = $30,000,0000$$

 $CF_1/Sh. = $30,000,000 / 10,000,000 \text{ shares} = 3

$$\frac{P_0}{CF_1} = \frac{$18}{$3} = 6x$$

2. Calculate P/CF multiple

$$P_0/CF_1 = $18 / $3$$

= **6.0**

Assumptions

The price multiple ratios have similar assumption requirements, each of which can be influenced by management behaviors, including:

- a. Future earnings
- b. Future cash flows
- b. Future sales
- Future growth rate C.
- The duration of sales, earnings or cash flow trends d.

E. Introduction to Discounted Cash Flow Analysis

Discounted cash flow (DCF) analysis attempts to determine the intrinsic (true) value of an equity security by determining the present value of its expected future cash flows. To apply DCF analysis an analyst takes the following steps:

- 1. Choose an appropriate model.
 - a. Dividend discount models (DDM) use the stock's expected dividends as the relevant cash flows. The Gordon constant growth model is an example of a simple dividend discount model.
 - b Free cash flow models including free cash flow to the firm (FCFF) and free cash flow to equity (FCFE). The free cash flow models discount the cash flow left over by the firm after satisfying certain required obligations including working capital needs and fixed capital investment.
 - c. Residual Income models represent the income left over after the firm satisfies the investor's required return.
- 2. Forecast the security's cash flows using one of the model approaches above.
- 3. Select a discount rate methodology. The CAPM is a popular method used to estimate the required return for an equity security.
- 4. Estimate the discount rate and apply to the appropriate DCF model.
- 5. Calculate the equity security's intrinsic value and compare to its current market value.



Candidates are not expected to apply DCF models for the CPA Exam. The candidate should be familiar with the general premise of discounted cash flow analysis.

II. EVALUATING ASSUMPTIONS USED IN VALUATIONS

Forecasting methods have numerous subjective elements that are subject to behavioral influences. Behavioral finance examines investor behavior and how this behavior affects financial markets.

A. Generalized Rules of Thumb

Generalized rules of thumb that are often used in forecasting can distort the objective evaluation of evidence.

1. Tendency to Use Stereotyped Characterizations

The P/E and PEG ratios and discounted cash flow (DCF) techniques are useful, but all analytical techniques are not equal. The PEG ratio and other P/E techniques are less rigorous than the detailed analysis required for DCF.

2. Use Adjustments from Presumed Baselines

Adoption of an earnings or price amount that is correct and adjusting it upward or downward for assumptions can result in errors, because adjustments are usually insufficient.

3. Use of Intuition Rather than Analysis

Failure to use objective analysis in favor of beliefs or emotions can result in the miscalculation of values or assumptions.

B. Behavioral Biases - Distorts judgment

1. Excessive Optimism

The strong belief or <u>overestimation of positive results</u> is a bias that can distort the valuation model.

2. Confirmation Bias

Managers experience confirmation bias when they use only data that confirms their conclusions and ignore data that challenges their ideas.

3. Overconfidence

The <u>strong belief that decisions and evaluations are correct, which can lead to investors</u> overemphasizing their ability to process and interpret information.

4. Illusion of Control

The erroneous belief that the <u>financial manager has control over valuation outcomes that</u> are ultimately the result of market forces.

C. The Effect of Loss Aversion

1. Losses Are More Distracting Than Gains

Managers are more likely to try to beat the odds to restore profitability. Riskier behavior comes when losses are higher. Prudent and analytical management of gains is more likely than management of losses.

2. Managers Are Generally Averse to Sure Losses

Even knowing that the likelihood of reversing projected losses is remote will not motivate the financial manager to take a sure loss. The chance, however remote, that losses might be reversed will keep the manager from making the logical decision to absorb a sure loss with no opportunity of recovery and, instead, escalate the commitment in hopes that the projected results will reverse.

III. MODELS FOR VALUING OPTIONS

A. Definition of an Option

An option is a contract that entitles the owner (holder) to buy (call option) or sell (put option) a stock (or some other asset) at a given price within a stated period of time. American-style options can be exercised at any time prior to their expiration. European-style options can be exercised only at the expiration or maturity date of the option. An option may or may not have value.

B. Valuing Options—The Black-Scholes Model

A number of different factors enter into the determination of the value of an option. A commonly used method for option valuation is the Black-Scholes model. The calculation itself is extremely complex and most likely beyond the scope of the CPA Exam. However, you do need a high-level understanding of the concepts and assumptions that underlie Black-Scholes. Accountants may use this method in valuing stock options when accounting for share-based payments. Option price calculators are widely available, so you do not need to understand the complexity of the actual calculations to apply this method.

1. Inputs into the Black-Scholes Model (determinants of the option value)

- a. Current <u>price of the underlying stock</u> (higher price → higher option value)
- b. Option exercise price

- c. Risk-free interest rate (higher rate \rightarrow higher option value)
- d. Current time until expiration (longer time → higher option value)
- e. Some measure of risk for the underlying stock (higher risk \rightarrow higher option value)
- f. The <u>dividend on the optioned stock</u> (higher dividend \rightarrow higher option value)

2. Assumptions Underlying the Black-Scholes Model

- Stock prices behave randomly.
- b. The risk-free rate and volatility of the stock prices are constant over the option's life.
- c. There are no taxes or transaction costs.
- d. The <u>stock pays no dividends</u>, although the model can be <u>adapted to dividend-paying stock</u>.
- e. The options are European-style (exercisable only at maturity).
- f. An option may or may not have value.

3. Limitations of the Black-Scholes Model

Despite its current use, the Black-Scholes model does have several limitations:

- a. Due to the model's assumptions, results generated from the Black-Scholes model may differ from real prices.
- b. It assumes instant, cost-less trading, which is unrealistic in today's markets.
- c. The model tends to <u>underestimate extreme price movements</u>.
- d. The model is not applicable to pricing American-style options.

C. Valuing Options—Binomial Model

Another option pricing model is the binomial or Cox-Ross-Rubinstein model. It is a variation of the original Black-Scholes model. The binomial model considers the underlying security over a period of time, as compared to the value at one point in time under the Black-Scholes model. This model is useful for valuing American-style options, which can be exercised over a period of time.

1. Applying the Model

- a. The assumptions of the binomial model are:
 - (1) a perfectly efficient stock market; and
 - (2) the underlying security price will move up or down at certain points in time (called nodes) during the life of the option.
- b. The result of applying the model is a tree diagram showing the possible values of the options at different points in time or nodes. The math for this approach is also beyond the scope of the CPA Exam.
- c. The benefits of the binomial method are:
 - (1) it can be used for American-style options; and
 - (2) it can be used for stocks that pay dividends without modifying the model, as is necessary with Black-Scholes.

INTERNAL AUDITING STANDARDS

I. INTERNATIONAL PROFESSIONAL PRACTICES FRAMEWORK (IPPF)

International Standards for the Practice of Internal Auditing are published by the Institute of Internal Auditors (IIA). The standards for the internal audit profession are meant to provide internationally authoritative guidance within the context of an international practices framework. The international professional practices framework organizes the authoritative guidance published by the IIA. Authoritative guidance is divided into two categories: mandatory and endorsed/strongly recommended.

A. Mandatory Guidance

1. Definition of Internal Auditing

- a. Internal auditing is an independent and objective assurance and consulting activity designed to add value and improve an organization's operations.
- b. Internal auditing adds value and helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of the following:
 - (1) Risk management
 - (2) Internal control
 - (3) Governance processes

2. International Standards

The International Standards for the Practice of Internal Auditing (the *Standards*) comprise a structured listing of standards for internal auditors that includes attribute standards, performance standards, and implementation standards. The purpose of the *Standards* is to:

- a. define principles that represent internal audit;
- b. provide a framework for value-added activities;
- c. establish a basis for evaluation of internal audit performance; and
- d. foster improved processes and operations.

3. Code of Ethics

The Code of Ethics issued as part of the IPPF applies to both individuals and entities that provide internal auditing services. The code provides principles and rules of conduct under four headings.

a. Integrity

Internal auditors are to perform work with honesty, diligence, and responsibility in full observation of the law and consistent with the ethical objectives of the organization.

b. Objectivity

Internal auditors are to exhibit the highest level of professional objectivity in gathering, evaluating, and communicating information about the activity or process being examined. Internal auditors should not participate in relationships that represent conflicts of interest and should disclose facts that may affect evaluation of their reports.

c. Confidentiality

Internal auditors respect the value and ownership of information they receive and do not disclose information without appropriate authority (unless a legal or professional obligation to do so exists) or use information for personal gain.

d. Competency

Internal auditors apply the knowledge, skills, and experience needed in the performance of internal auditing services.

B. Endorsed and Strongly Recommended Guidance

1. Position Papers

Position papers assist a wide audience—including those not in internal auditing professions—in understanding significant governance, risk, or internal control issues, and defining roles and responsibilities of internal auditing. Position papers form part of the International Professional Practices Framework.

2. Practice Advisories

Practice advisories address approach, methodology, and considerations, but not detailed processes and procedures. They offer guidance to assist internal auditors in applying the *Code of Ethics* and the *Standards* and to promote good practices.

3. Practice Guides

Practice guides address detailed processes and procedures in specific circumstances.

PASS KEY

Although the International Standards for the Practice of Internal Auditing are unique to internal audit, the standards are structured in a way that addresses the auditor's responsibilities in a manner similar to generally accepted auditing standards (GAAS).

Attribute standards published by the IIA address many of the same issues as the **general standards** under generally accepted auditing standards. Issues related to auditor independence, technical proficiency, and professional care are addressed here.

Performance standards published by the IIA address many of the same issues as **field work standards** and **reporting standards** under GAAS. Issues related to planning and supervision of the engagement and documentation of evidence or basis for conclusions are addressed here along with generic reporting requirements.

Implementation standards published by the IIA are embedded within the attribute and reporting standards to address the requirements of implementing both assurance and consulting activities.

II. INTERNAL AUDIT STANDARDS—ATTRIBUTE STANDARDS

The attribute standards are general standards regarding engagement definition, auditor independence and objectivity, auditor proficiency and professional care, and quality assurance including continuing professional development.

PASS KEY

Attribute standards included in the International Standards for the Practice of Internal Auditing include the following:

- Purpose, Authority, and Responsibility
- · Independence and Objectivity
- Proficiency and Due Professional Care
- Quality Assurance and Improvement Program

A. Purpose, Authority, and Responsibility

An internal audit charter should document the purpose, authority, and responsibility of the internal audit function. Both assurance and consulting services should be defined in the charter.

B. Independence and Objectivity

The chief internal audit officer of an organization should have unrestricted access to senior management and the board to promote the independence required to effectively perform the internal audit function. The chief internal audit officer must also be unbiased in approach to ensure objectivity.

1. Organizational Independence

The chief internal auditor reporting line and level should promote independence and objectivity. The chief internal auditor should report the organizational independence of the internal audit function to the governing board of the entity annually.

2. Individual Objectivity

Internal auditors must be free of conflicts of interest that might compromise their individual objectivity.

3. Impairments to Independence or Objectivity

Impairment of independence or objectivity in fact or appearance should be fully disclosed. The character of the disclosure depends on the nature of the impairment.

- a. Internal auditors must refrain from assurance services that involve assessments of specific operations for which they were previously responsible within the previous year.
- Internal auditors may provide consulting services relating to operations for which they had previous responsibilities.

C. Proficiency and Due Professional Care

Engagements must be performed with proficiency and due professional care.

1. Proficiency

Professional designations represent strong evidence of proficiency. Internal auditors are expected to understand fraud detection techniques as well as technology risk and controls.

2. Due Professional Care

Internal auditors must apply the care and skill expected of a reasonably prudent and competent internal auditor. Due professional care does not imply infallibility.

D. Quality Assurance and Improvement Program

The chief audit executive must develop and maintain a quality assurance and improvement program that covers all aspects of the internal audit activity. The objective is to assure conformity with the definition of internal auditing and the *Code of Ethics*.

1. Quality Program Assessments

The quality assurance and improvement program must include both internal and external assessments.

a. Internal Assessments

Internal audit entities should be tasked with ongoing and periodic evaluations of program effectiveness.

b. External Assessments

An external assessment must be conducted at least once every five years by a qualified independent assessor.

2. Reporting on the Quality Program

The chief audit executive must communicate the results of the quality assurance and improvement program to senior management and the board.

III. INTERNAL AUDIT STANDARDS—PERFORMANCE STANDARDS

The performance standards are overarching field work standards that include planning, auditor communications, defining engagement scope in a manner that adds value consistent with the definition of internal auditing, and documenting work in a manner that supports conclusions.



PASS KEY

Performance standards included in the International Standards for the Practice of Internal Auditing are composed of seven areas:

- 1. Managing the Internal Audit Activity
- 2. Nature of Work
- 3. Engagement Planning
- 4. Performing the Engagement
- 5. Communicating Results
- 6. Monitoring Progress
- 7. Management's Acceptance of Risk

A. Managing the Internal Audit Activity

The chief audit executive must effectively manage the internal audit activity to ensure it adds value to the organization. *Effective management* is characterized by ensuring that activities are contemplated by the internal audit charter and that activities conform to the definition of internal audit, the Standards and the Code of Ethics. Added value is characterized by objective and relevant assurance and contributions to the effectiveness and efficiency of governance, risk management, and control processes.

1. Planning

The chief audit executive must establish risk-based plans to determine the priorities of the internal audit activity, consistent with organizational goals. The risk plan should consider several factors.

- a. Organizational risk frameworks that define risk appetite levels set by management.
- b. If no risk framework exists, the chief audit executive uses their own judgment of risk after consulting and receiving input from the entity's senior management and board of directors.

2. Communication and Approval

The chief audit executive must communicate:

- a. The internal audit activity's plans and requirements for staffing and other resources (including significant interim change) and obtain approval from senior management and the board for those plans.
- b. The effect (i.e., the potential scope limitations or timing delays) of resource limitations.

3. Policies and Procedures

The chief audit executive must establish policies and procedures to guide the internal audit activity and should consider the size and complexity of audit activities when determining the policies and procedures.

4. Reporting to the Board and Senior Management

The chief audit executive must report periodically to senior management and the board on the internal audit activity's purpose, authority, responsibility, and performance relative to its plan.

5. External Service Provider and Organizational Responsibility for Internal Audit

External providers of internal audit activities must inform management that internal controls are the responsibility of management.

B. Nature of Work

The internal audit activity must evaluate and contribute to the improvement of governance, risk management, and internal control processes using a systematic and disciplined approach.

1. Governance

The internal audit activity must assess and make appropriate recommendations for improving the governance process in its accomplishment of the following objectives:

- a. Promoting appropriate ethics and values within the organization (internal audit activities contemplate a review of ethics and compliance programs);
- Ensuring effective organizational performance management and accountability (internal audit activities anticipate an assessment of the adequacy of IT governance);
- c. Communicating risk and control information to appropriate areas of the organization; and
- d. Coordinating the activities of and communicating information among the board, external and internal auditors, and management.

2. Risk Management

The internal audit activity must evaluate the effectiveness of risk-management processes and contribute to the improvement of risk-management processes, including an assessment of:

- a. management's alignment of organizational goals and mission.
- b. management's identification and assessment of risks.

- c. risk response designs that align with risk appetite.
- d. timely communication of relevant risk information.

3. Internal Control

The internal audit activity must assist the organization in determining whether the entity has met its strategic objectives, maintaining effective internal controls by evaluating their effectiveness and efficiency, and by promoting continuous improvement of internal control.

C. Engagement Planning

Internal auditors must develop and document a plan for each engagement, including the engagement's objectives, scope, timing, and resource allocations.

1. Planning Considerations

In planning the engagement, internal auditors must consider:

- a. the objectives of the activity being reviewed and the means by which the activity controls its performance;
- b. the significant risks to the activity, its objectives, resources and operations, and the means by which the potential effect of risk is kept to an acceptable level;
- c. the adequacy and effectiveness of the activity's governance, risk-management and control processes compared to a relevant control framework or model; and
- d. the opportunities for making significant improvements to the activity's governance, risk-management and control processes.

2. Engagement Objectives

Objectives must be established for each engagement.

- a. Engagement objectives must reflect the results of a preliminary risk assessment performed prior to beginning the engagement.
- b. Engagements must consider the probability of errors, fraud, noncompliance, or other exposures.

3. Engagement Scope

The established scope must be sufficient to achieve the objectives of the engagement, including considerations of relevant systems, records, personnel, and physical properties.

4. Engagement Resource Allocation

Internal auditors must determine if there are appropriate and sufficient resources to achieve the engagement objectives.

5. Engagement Work Program

Internal auditors must develop and document work programs that achieve the engagement objectives. The program must be approved prior to implementation and changes to the program must be similarly approved.

D. Performing the Engagement

Internal auditors must identify, analyze, evaluate, and document sufficient information to achieve the engagement's objectives.

1. Identifying Information

Internal auditors must identify sufficient, reliable, relevant, and useful information to achieve the engagement's objectives.

2. Analysis and Evaluation

Internal auditors must base conclusions and engagement results on appropriate analyses and evaluations.

3. Documenting Information

Internal auditors must document relevant information to support the conclusions and engagement results.

4. Engagement Supervision

Engagements must be properly supervised to ensure objectives are achieved, quality is assured, and staff is developed.

E. Communicating Results

Internal auditors must communicate the results of engagement.

1. Criteria for Communicating

Communications must include the engagement's objectives and scope as well as applicable conclusions, recommendations, and action plans. Conclusions or opinions can take numerous forms, including ratings or descriptions of results.

2. Quality of Communications

Communications must be accurate, objective, clear, concise, constructive, complete, and timely.

3. Engagement Disclosure of Noncompliance With Standards

When nonconformance with the *Definition of Internal Auditing*, the *Code of Ethics* or the *Standards* affects a specific engagement, communication of the engagement results must disclose the:

- a. principle or rule of conduct of the Code of Ethics or Standards with which full conformance was not achieved:
- b. reason(s) for nonconformance; and
- c. effect of nonconformance on the engagement and the communicated engagement results.

4. Disseminating Results

The chief audit executive must review and approve the final engagement communication before issuance and deciding to whom and how the communication will be disseminated. Although the chief audit executive may delegate these duties, he or she maintains overall responsibility for all communication.

F. Monitoring Progress

The chief audit executive must establish and maintain a system to monitor the disposition of results communicated to management.

G. Management's Acceptance of Risk

When the chief audit executive concludes that management has accepted a level of risk that may be unacceptable to the organization, the chief audit executive must discuss the matter with senior management.

If the chief audit executive determines that the matter has not been appropriately resolved, the chief audit executive must communicate the matter to the board.

IV. INTERNAL AUDIT STANDARDS—IMPLEMENTATION STANDARDS: ASSURANCE ACTIVITIES

The implementation standards are embedded within the attribute and performance standards, and provide requirements consistent with the unique issues applicable to assurance or consulting activities. Assurance services involve the internal auditor's objective assessment of evidence to provide an independent opinion or conclusions regarding an entity, an operation, a function, a process, a system, or other subject matter.

A. Scope

The nature and scope of the assurance engagement are determined by the internal auditor.

B. Parties Involved in Assurance Services

There are generally three parties involved in assurance services:

1. Auditee

The person or group directly involved with the entity, operation, function, process, system, or other subject matter.

2. Internal Auditor

The person or group making the assessment.

3. User (Sponsor)

The person or group using the assessment.

V. INTERNAL AUDIT STANDARDS—IMPLEMENTATION STANDARDS: CONSULTING ACTIVITIES

Consulting services are advisory in nature and are generally performed at the specific request of an engagement client. When performing consulting services, the internal auditor should maintain objectivity and not assume management responsibility.

A. Scope

The nature and scope of the consulting engagement are subject to agreement with the engagement client.

B. Parties Involved in Consulting Services

1. Internal Auditor

The person or group offering the advice.

2. User (Sponsor)

The person or group seeking and receiving the advice.